HIGHER SPEEDS DEMAND...

...HIGHER Track Standards

HIGHER SPEEDS of 80, 90 or 100 miles an hour demand higher track standards. • Higher track standards are possible only when rail creepage is entirely eliminated.

RAIL ANTI-CREEPERS

in sufficient numbers should be used. The standard on many railroads is

10 to 12

RAIL ANTI-CREEPERS PER RAIL

THE P. & M. CO.

CHICAGO NEW YORK
LONDON MONTREAL
PARIS SYDNEY

Reliance HY-CROME *Spring Washers*

EFFICIENCY
•
ECONOMY

HY-PRESSURE HY-CROME
Edgemark of Quality

DEPENDABILITY
•
SAFETY

Damage to rail ends can be reduced to a minimum through the use of Reliance HY-PRESSURE HY-CROME Spring Washers, which provide a uniform, pre-determined tension in the joint bolts, with maximum efficiency at a minimum expense. The life of joint parts can be prolonged by compensating for inevitable wear and looseness.

EATON MANUFACTURING COMPANY

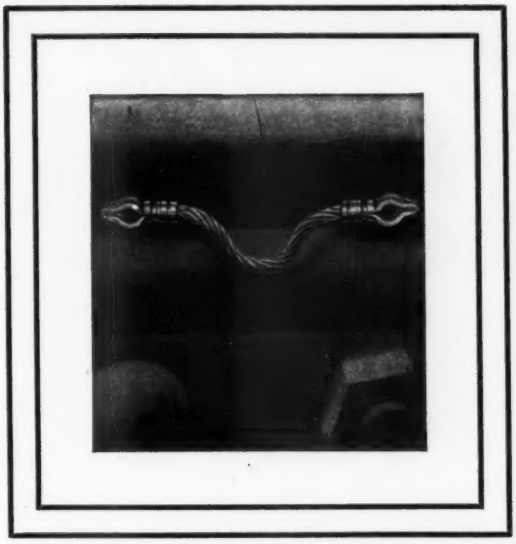
Reliance Spring Washer Division

MASSILLON, OHIO

Branches: New York - Cleveland - Detroit - Chicago - St. Louis - Montreal

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

Raco Bonds



(Patent Nos. 1,945,980 and 2,045,126)

They increase signal protection against broken rails.

The use of Raco Bonds brings into the track circuit all the rail joints, which are shunted out by long bonds that span the angle bars.

They improve the operation of practically all track circuits.

They effect, on many circuits, a radical reduction in rail resistance, which results in producing some, or all, of the following benefits:

Reduced consumption of battery current.

Elimination of some cells of battery.

Elimination of cut sections.

Improved shunting values.

Increased protection against foreign currents.

Greater uniformity and reliability of operation through weather changes.

The installed cost and the cost of maintenance of bonds are reduced.

Entirely apart from the great economies and advantages gained in track circuit operation by the use of short bonds, the Raco Bond actually saves users a very substantial percentage of the total cost of bonding rail with other types of bonds.

RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE
405 LEXINGTON AVENUE
(Chrysler Building)
NEW YORK

909 feet in 4 hours!

● Slabs placed, ready for 8 inches of ballast. Sub-ballast concrete slabs now carry 4,625 ft. of Missouri Pacific track on the second-heaviest traveled section of the system.

● Slabs on slope of bank quickly hoisted and set by crane —2 to 3 minutes per slab.

● Slide it up to the rail, unhook the cables, re-hook and move to final position. Simple . . . and speedy.

After 2 winters' experience with CONCRETE SUPPORTED TRACK

Missouri Pacific installs 2025 ft. more in record time

2600 ft. of concrete sub-ballast slab—installed in November, 1936, over a bad section of subgrade near Jones Ridge, Illinois—has given this service record through two winters:

Maintenance cost—$50 to $60.

Condition—excellent; no evidence of displacement of slabs.

As a result, the Missouri Pacific has installed another 2025 ft. of concrete track support. The job took only a few working days—101 slabs or 909 feet placed in a single day of 4 actual working hours!

Concrete Supported Track can help you lick high maintenance costs at bad spots. It absorbs and distributes loads over wider areas . . . gives uniform support at all seasons over practically all soils . . . resists frost damage and the pumping action of successively loaded ties . . . simplifies drainage problems.

Write for technical booklet, "*Concrete Supported Railway Track.*"

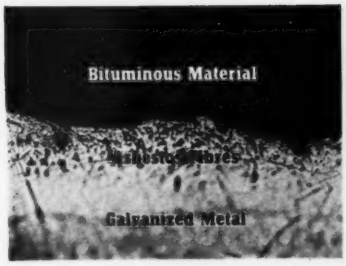
PORTLAND CEMENT ASSOCIATION

Dept. A7-27, 33 W. Grand Ave., Chicago, Ill.

A National Organization to Improve and Extend the Uses of Concrete

YOU COULDN'T FIND
A BETTER PIPE FOR RAILWAY DRAINAGE

This view shows how a "bonded metal" sheet is made to assure permanently tight adhesion between the bituminous material and the finished pipe.



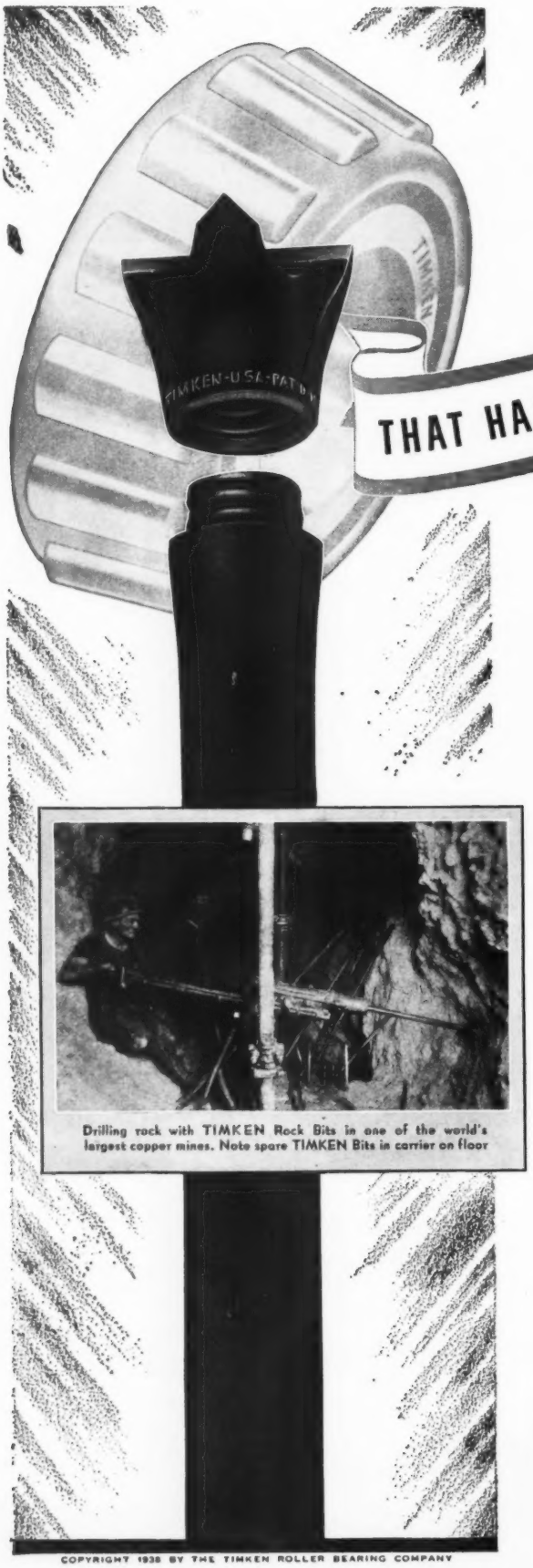
In this photomicrograph (highly magnified) you can see how the bituminous pavement and coating are actually "bonded" to the galvanized metal.

• When you specify Asbestos Bonded Armco pipe, you get a structure embodying all the desirable improvements made in 42 years of drainage research.

Here in this one pipe are the proved strength and flexibility of corrugated metal—the proved rust-resistance of galvanized ARMCO Ingot Iron—plus a special bituminous pavement and coating used successfully for 12 years. Even more important, this bituminous seal against wear and corrosion is inseparably bonded to the pipe. It does not crack, peel or chip off.

To get complete information on Asbestos Bonded Armco pipe, just address our nearest office. Ingot Iron Railway Products Co. (member of the Armco Culvert Mfrs. Assn.), Curtis St., Middletown, Ohio; Atlanta, Salt Lake City, Los Angeles, Minneapolis, Spokane, St. Louis, Richmond, Portland, Philadelphia, Dallas, Houston, Denver, Chicago, Cleveland, Berkeley, California.

ASBESTOS BONDED ARMCO PIPE



Drilling rock with TIMKEN Rock Bits in one of the world's largest copper mines. Note spare TIMKEN Bits in carrier on floor

A TIMKEN Product THAT HAS STARTLED THE WORLD

Drilling holes in rock for blasting used to be done by means of steel drill rods with cutting edges forged on the ends. They had to be kept sharp by reforging —a constant source of expense. Then came the TIMKEN Rock Bit—a radically new tool embodying the principle of the safety razor—to revolutionize rock drilling. There's no reforging with TIMKEN Rock Bits. When a bit becomes too dull to drill, it is simply unscrewed from the rod and a new one put on—a matter of seconds. Drilling costs have in many cases been cut in half. You will appreciate what this means in large mines and quarries and on big construction projects where thousands of holes—many of them 15 to 20 feet deep—are drilled in solid rock every day. Can you think of a better investment for the bit user? The space available here does not permit going into detail regarding the many advantages of this remarkable rock drilling tool. You'll find the complete story in the Timken Rock Bit Booklet. Write for a copy.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

TIMKEN

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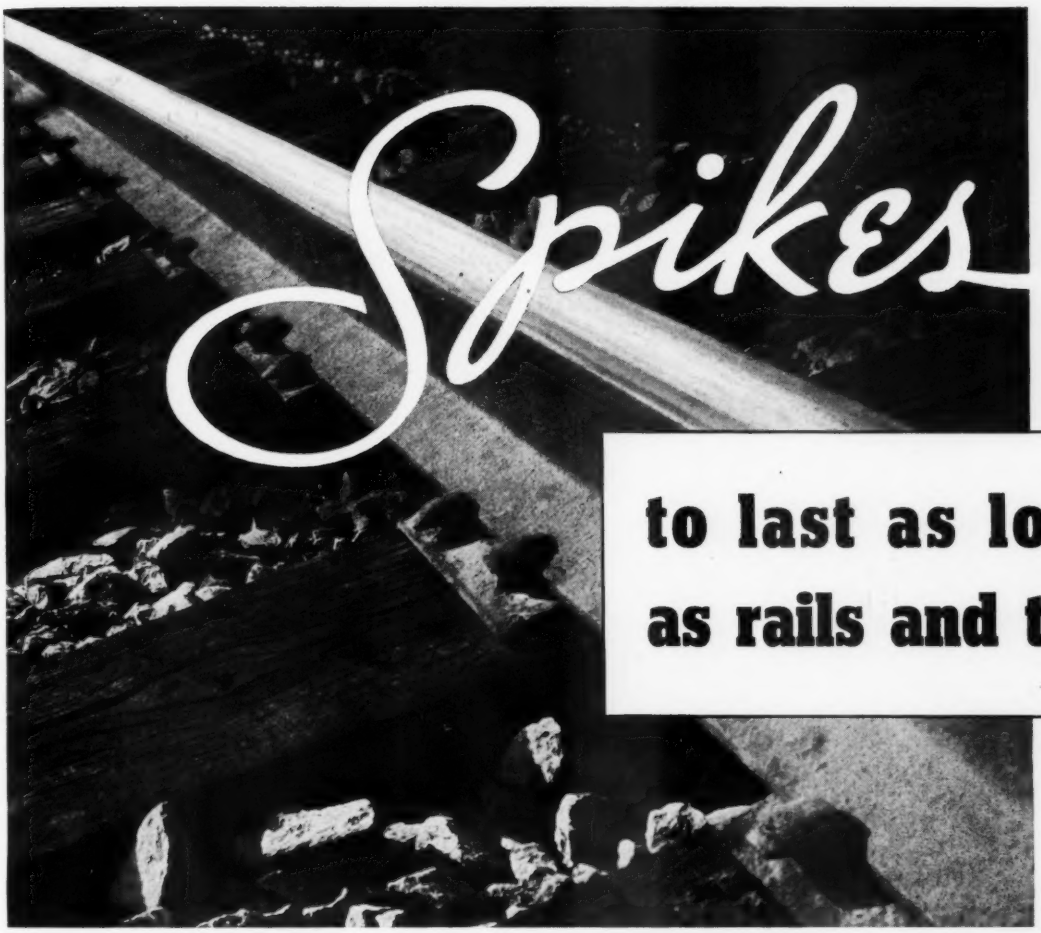


A few years ago track spikes seldom had to be replaced. Now many roads are finding it necessary to respike whole sections of mainline track because, with longer life of rails and ties, spikes sometimes rust out before track has to be relaid.

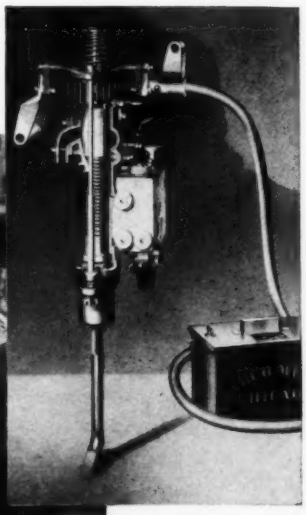
Copper-bearing steel offers the opportunity to eliminate this maintenance work. Tests invariably show that steel, alloyed with a small but accurately controlled amount of copper, will have two, three, even four times the resistance to corrosion of ordinary open-hearth steel. This is an ample increase in life to have spikes last as long as rails or ties.

Extra cost of spikes made of copper-bearing steel is but 10 to 15 cents per hundred pounds, depending on copper content used—about three per cent more. So great is the advantage and so small the additional cost that many roads are now regularly specifying this rust-resisting material. If yours is not among those now buying copper-bearing spikes, we suggest that you consult our nearest district office.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

BARCO TYTAMPERS
ARE YEAR-ROUND TOOLS



34
Railroads Are Now Using
BARCO
Gasoline Hammers And Unit Tytampers

Experience on 34 railroads has demonstrated clearly that more feet of track per hour per tamper may be accomplished at lower cost per foot, due to the extreme portability of these machines and the elimination of cumbersome and expensive auxiliary equipment.

Lower initial cost and lower cost of maintenance in either small or large gangs during the tamping season.

When not required for tamping they may be used for general demolition work, breaking ice, frozen coal or cinders, or for crib busting.

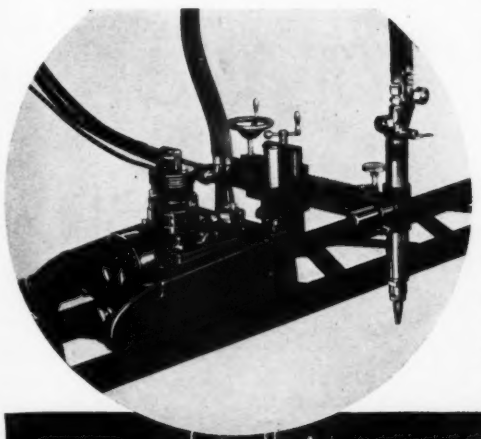
BARCO

BARCO MANUFACTURING CO.
1805 W. WINNEMAC AVE. CHICAGO, ILL.

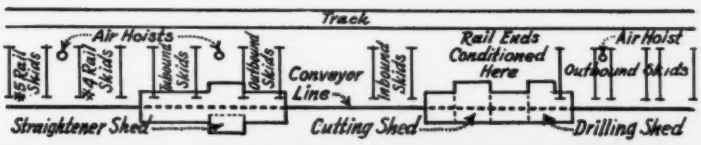
THE HOLDEN CO., LTD., IN CANADA
MONTREAL MONCTON TORONTO WINNIPEG VANCOUVER

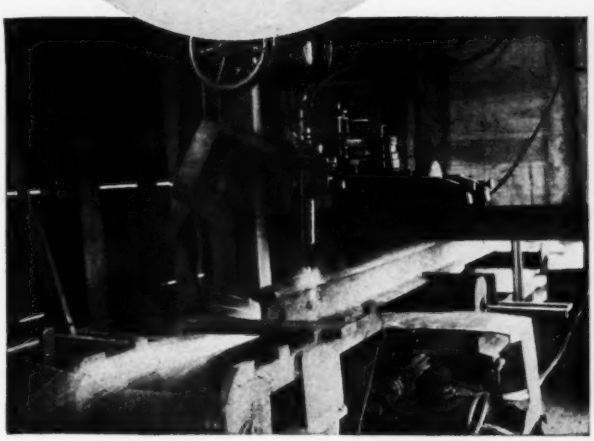
Unit TYTAMPERS

An example of efficiently organized RAIL RECONDITIONING



Diagrammed below is the layout of a large "straight-line" mass production rail reconditioning plant recently put in operation by a prominent railroad. A notable feature is the oxyacetylene cropping of the rail ends with a battery of motor-driven AIRCO-DB RADIAGRAPHS.





CLEAR TRACKS TO RAILROAD ECONOMY

Everyone of the following operations offers railroads the opportunity to cut costs. AIRCO is prepared to supply everything needed to perform one and all of them.

- AUTOMATIC OXYACETYLENE RAIL END CROPPING
- HEAT TREATING RAIL ENDS, FROG AND SWITCH POINTS
- WELDING UP RAIL ENDS
- OXYACETYLENE FLAME HARDENING
- OXYACETYLENE AND ELECTRIC ARC WELDING
- LOCOMOTIVE AND CAR SCRAPPING
- FLAME CUTTING LOCOMOTIVE AND CAR PARTS
- HARD SURFACING
- METAL SPRAYING

Full details about any of these operations promptly furnished on request. No obligation. Write for them.

There are two cutting stations so arranged that the back end of one rail and the forward end of the next are cut off simultaneously.

Each station has two RADIAGRAPHS, one over the other. As shown above, the upper RADIAGRAPH first cuts the top half of the rail; then the lower RADIAGRAPH, with torch pointing up, cuts the bottom half. Means are provided for accurate positioning and quick clamping of the rails.

The RADIAGRAPH cuts clean and true because every factor in the cutting operation is under *accurate mechanical control.* In addition to rail cropping, it is used for flame hardening rails, and of course, for cutting steel plate.

Our MW field engineers are ready to give you full particulars about the RADIAGRAPH and its uses—without obligation. Write for them.

AIR REDUCTION

SALES COMPANY

General Offices: 60 East 42nd St., New York, N. Y.

DISTRICT OFFICES IN PRINCIPAL CITIES

SERVING RAILROADS FROM COAST TO COAST

No. 115 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Responsibility

July 1, 1938

Dear Reader:

As you read of the tragic accident in Montana a few days ago, I am sure that the thought struck home to you, as it did to me, that the work of a maintenance officer is permeated with a degree of responsibility that attaches to few other vocations. Here a nationally known transcontinental passenger train, traveling at its normal rate of speed, crashed without warning through a bridge, killing 47 persons.

Such an accident arouses the sympathy of every maintenance officer for those in charge of this property, especially because it would appear that every reasonable precaution had been taken against such an accident and that it was due to what is termed by the courts as "an act of God". The structure that collapsed consisted of steel girder and concrete slab spans on concrete piers that extended well below the stream bed into solid gravel. It had stood for 25 years without any indication of trouble.

A track walker had passed over the bridge a short time before the disaster, at which time the stream bed was practically dry. The train in question ran through no rain and when it crossed the Yellowstone River a short distance downstream from the mouth of the creek in question, that stream showed no evidence of flood. There was no water over the track and no evidence of flood conditions. Yet the worst accident in years occurred, caused by the sudden rush of water down a dry wash from a local cloudburst 20 miles back from the track.

No criticism can attach to either maintenance or operating officers for such an accident. It is clearly one of those occurrences for which there is no protection. Yet such an accident brings to every maintenance officer a new realization of his responsibility that causes him to examine his tracks and his structures anew to reassure himself that he is taking all reasonable precautions to provide safe, dependable transportation. He is in a very real measure a custodian of the public safety.

Yours sincerely,

Elmer T. Howson

ETH:EW

Editor

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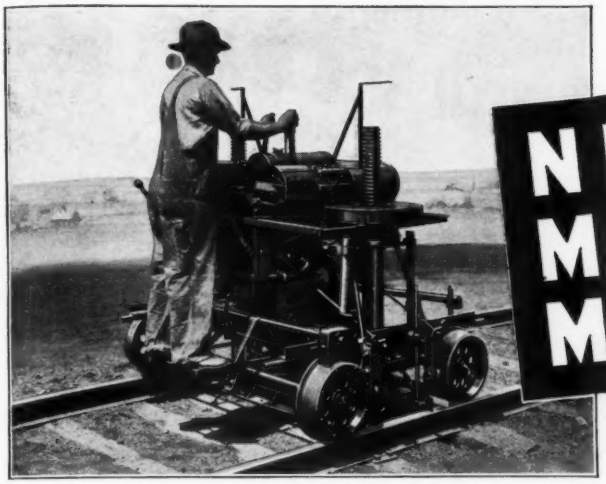
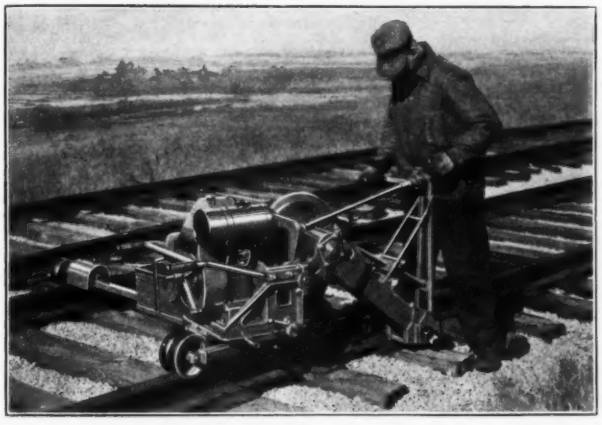
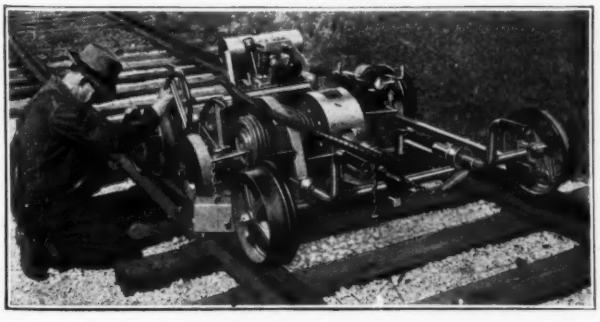


NECESSARY MAINTENANCE MUST BE DONE

The Nordberg Power Jack for ballasting and grade raising.



Light and fast New Nordberg Track Wrench keeps track bolts uniformly tight.



New light weight grinder for rail and especially for frog work.

Where the tendency is to curtail necessary track maintenance because of limited appropriations, it is still possible to accomplish more work and a better quality of work if Nordberg time saving machines are selected for the various jobs. The Nordberg Line of power tools is especially adapted to reduce the expense of track work, not only in replacing unnecessary labor but by completing the job sooner.

If it is a ballasting or surfacing job, there is the Power Jack with its one operator instead of a slow moving gang with hand jacks. It will easily keep ahead of any tamping gang.

For periodical joint tightening, or when used on a rail relaying job, the Nordberg Track Wrench will show a big saving as compared with hand tightening. Every bolt will have the same uniform tension.

When reconditioning and maintaining rail, frogs and crossings, there are three Nordberg Grinders; money savers because of their speed and accuracy of work.

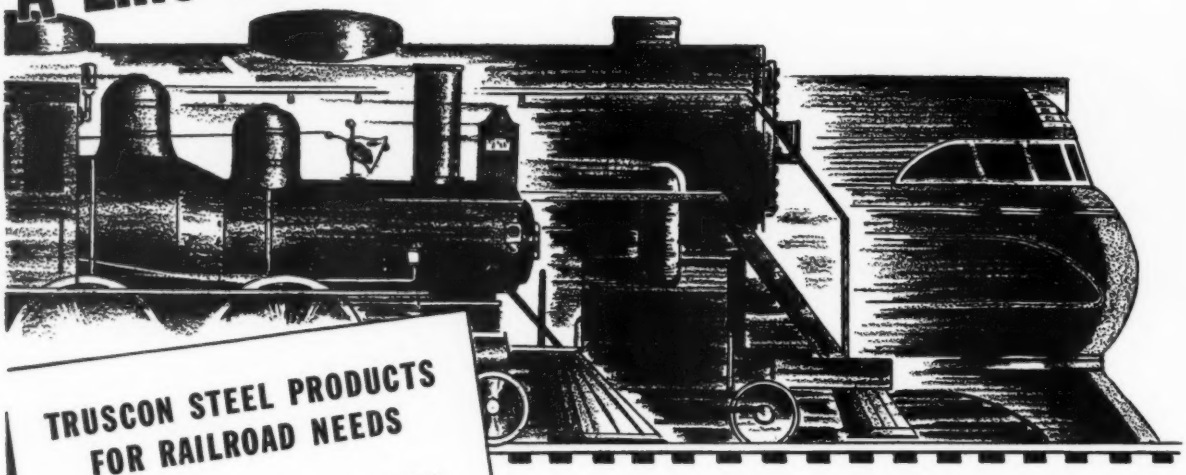
For relaying work, Nordberg offers the Adzing Machine, Spike Puller and Rail Drill, now considered standard equipment wherever rail is laid.

Accomplish the most from your appropriation by putting Nordberg Tools to work on your maintenance jobs.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

A Line that grew up with the Railroads



TRUSCON STEEL PRODUCTS FOR RAILROAD NEEDS

STANDARD STEEL BUILDINGS, STEEL WINDOWS AND DOORS (All Types)

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WELTRUS HIGHWAY CROSSINGS

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STEEL POLES

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●

☆ Truscon's coverage of railroad needs is the result of years of close cooperation with railway engineers and maintenance officials. Many products developed by Truscon originated in those "shoulder to shoulder" conversations between railroad men and Truscon engineers. ● Today, a great backlog of deferred railroad needs looms higher and higher. The time approaches when many of these needs will demand quick and experienced attention. ● What if actual commitments must be deferred? Nothing prevents *us* from helping *you* to accumulate important data NOW that you may need sooner than you think. ● Let's get "shoulder to shoulder" on some preliminary planning. We may develop something very much worthwhile as we have in the past *when we were growing up with the railroads.*

TRUSCON *Steel company*

YOUNGSTOWN • • • OHIO

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

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Oxweld Procedures for Rebuilding Switch Points and Frogs Save Renewal Costs

BY rebuilding worn switch points and frogs under Oxweld procedures, these parts can be kept in efficient condition at a fraction of the cost of installing new units.

Weld In or Out of Track

Welding operations should preferably be done in track; however, where traffic is heavy, switch points and frogs can be removed and reconditioned near the location where they are used, or brought to a centralized shop for this purpose. Oxweld M. W. Welding Rod is ideally suited for this work, because it provides a wearing surface that resists the impact and abrasion of continuous, heavy traffic, and materially increases the service life of switch points and frogs.

Time-Saving Applications

Building up switch points and frogs under Oxweld procedures is typical of the time-saving applications of the oxy-acetylene process which are constantly being developed to effect economies in the maintenance-of-way work of Oxweld customers. The Oxweld Railroad Service Company, Unit of Union Carbide and Carbon Corporation, Carbide and Carbon Building, Chicago and New York.

"Oxweld" and "M.W." used herein are registered trade-marks.

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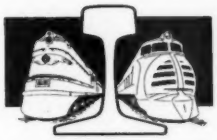
RAILROAD SERVICE
SINCE 1912
OVER A QUARTER CENTURY OF SERVICE
TO THE MAJORITY OF CLASS I RAILROADS

Railway Engineering and Maintenance



The Railroads

What Is The Matter With Them?

WHAT is the matter with the railroads? This question is being raised in many quarters. It is a topic of live concern in Washington. It is of very direct interest to every industry dependent upon the railways for transportation. It is of equal concern to every railway employee.

To indicate what has happened to the railways, let us look at a few facts. Between 1896 and 1916, the freight traffic of the railways increased 260 per cent. In that period the number of employees increased from 827,000 to 1,654,000. During the next 20 years—from 1916 to 1936—there was no increase in traffic and the number of employees declined from 1,654,000 to 1,066,000. Even if all the traffic handled on the highways is included, the total volume of traffic moved by all agencies in 1936 was only 25 to 30 per cent larger than was handled by the railways alone in 1916.

To carry this contrast still further, prior to 1916 the railways experienced frequently recurring periods of car shortage when the traffic exceeded their ability to handle it. During the same period, maintenance programs were limited frequently by shortages of labor, even though immigration from Europe was then the largest in our history. Yet today critics of the railways are contending that they are vastly over-expanded and are advocating widespread abondonment and tearing up of facilities—and in labor, we have widespread unemployment.

Why this decided change in trend? What has brought it about? What steps are necessary to correct it? The determination of the answers to these questions is fundamental to the prosperity of this country as well as to the stability of one of its greatest industries. Let us look at a few facts.

Industry Slows Down

In the first place, we face the fact that all industry has slowed down. In the five years ending with 1930, the total income of the American people averaged $80,000,000,000 a year; it was $85,000,000,000 in 1929. In the five years ending with 1935, it averaged only $50,000,000,000. In 1936 and 1937 it averaged $63,000,000,000; but, as a result of the recession through which we are now passing, it is evident that it will again be down to $50,000,000,000 in 1938.

The first difficulty of the railroads is, therefore, that of a reduced volume of traffic resulting from the decline in all business. In the first five months of 1938, their freight traffic, from which they derive 80 per cent of their revenues, was 40 per cent less than in 1929. If the railways were now handling the same tonnage of freight as in 1929, even with the present depressed rates, they would not be in the serious predicament in which they now find themselves but would be solvent, employing many thousands more men and contributing to recovery in many other industries through their purchases of large volumes of materials and equipment from these industries.

The first and most pressing step to be taken in aid of the railways is the adoption of those policies nationally that will stimulate confidence among the public and encourage expansion in business. This is vital to all industry. When public sentiment comes to the point of view that business should be encouraged and stimulated rather than penalized and handicapped, factories will again reopen and gainful employment be available for the American workman. With such revival, traffic will again flow over the railways in enlarged volume and they will be able to call back into service many thousands of maintenance of way and other railway employees.

Subsidized Competition

But increased traffic alone will not solve the railways' difficulties. There are other problems to be cleared away. One of these is the public subsidization of competing agencies of transportation on the highways and waterways and in the air. Each of these agencies is diverting traffic from the railways. Yet none of them could long exist if required to pay its own way on a basis comparable with the railways.

The extent of this subsidization is shown by the fact that some $15,000,000,000 of taxpayers' money has been spent to provide these competitors of the railways with improved highways and waterways. As taxpayers, the railways are among the largest contributors to this fund; yet they are required to spend one-third of every dollar

they earn for the maintenance of their own roadway and structures and for interest on their investment in these facilities.

Furthermore, the government is making large expenditures for highway and waterway facilities in areas where ample transportation facilities are already in existence, creating a duplication of facilities that constitutes an economic waste. It is through such expenditures of public funds that highway and waterway competitors are able to divert from the railways traffic aggregating more than a billion dollars a year. Obviously, such competition is so unfair as to demand correction through the levying of adequate tolls on the users of these facilities or the granting of similar subsidies to the railways.

Other Difficulties

Another difficulty confronting the railways results from the passage of restrictive legislation such as is found in no other industry and that adds greatly to the cost of railway operation, without adding in corresponding degree to the public interest. Typical of such legislation are the excess-crew laws and other make-work statutes.

Still another basic difficulty confronting the railways lies in limitations on their ability to price the commodity they sell—transportation. In contrast with other industries, which are free to fix the price at which their products are sold, the freedom of the railways is so limited in this respect as to leave to them little initiative. Their recent attempt to increase their freight rates affords a striking illustration. Faced with increases in expenses and reductions in income from lowered rates elsewhere exceeding $500,000,000, the managements of the roads took steps to increase their rates by amounts sufficient to meet these added expenses. Yet they were denied this permission by the Interstate Commerce Commission, precipitating the present crisis. Again they have been endeavoring for years to secure from Congress a revision of the Interstate Commerce Act that will enable them to meet the competition of coastal water carriers without tearing down the intermediate rate structure, only to face repeated defeat year after year through political log-rolling.

Free the Railways

All these conditions point to the desirability—and the expediency—of freeing the railways from many of the restrictive handicaps that now limit their freedom of action and restore to them a large measure of that initiative that, wherever given free play, has made American industry the leader of the world. No measure will contribute more greatly to the revival of national prosperity than the revival of railway prosperity. When the capacity of the railroads to make purchases and employ men is restored, a long step will have been taken in the solution of the problem of improving business.

Proper Supervision—

Still as Important as Ever

ONE of the surest ways of inviting inefficiency and actual lost time in carrying out work involving a large amount of labor is lack of adequate supervision. While this is true with almost any type of work, it is particularly so with the larger gangs employed in maintenance of way work, with their multiplicity of specialized operations scattered over miles of territory and involving constant adjustment in methods and organization in order that they may proceed in the most efficient manner. At the same time, one of the surest ways to promote careless and unsafe practices among workmen—and trackmen are no exception—is to give them inadequate supervision. This may result either through requiring forces to work through long periods of the day without direct supervision, or through the overburdening of their supervisory officers with responsibilities to the point where they cannot give proper consideration to the details which frequently involve unsafe practices.

These facts are not unknown to railway officers. In fact, much thought and attention have been given to the matter of proper supervision. However, with constantly changing gang organizations, either as a result of changing methods or of reductions in forces to effect economies, the matter of supervision is not one that can be settled and then forgotten, but is rather one that must be kept in the forefront as constantly as the problems of the proper size of gangs and the proper methods of doing work.

With the continued necessity for economy in maintenance of way operations, coupled with the heavier demands that are being made on the track structure through increased speeds of operation, the responsibilities of supervisory officers all of the way down the line to and including assistant foremen have been increased materially. In many cases this has been brought about through the enlarging of territories or reductions in supervisory forces, but in many other cases, frequently overlooked, it has been brought about by a reduction in the size of the actual working forces to the point where supervisory officers are required to do much of the detailed track inspection that was done formerly by assistants or experienced men in their gangs.

It is true that as a result of force reductions, many foremen have fewer men to supervise than formerly, and can, therefore, give more detailed attention to the actual work that is being done by their men, WHILE THEY ARE WITH THEM. Too often, however, with responsibilities for safety over large territories on their hands, and with many inspections and reports to be made, now, in many cases, more important than heretofore because of reduced expenditures on the track, these foremen find it necessary to be away from their gangs for hours at a time. Aside from such situations, which are recognized generally as inadvisable, there is a feeling among many maintenance men that the supervision of forces is being spread out too thin in many cases to permit the greatest efficiency in operations, the highest standards of work, and the closest adherence to safe practices. An example of situations which have helped cause such concern is a recent mechanized rail-laying

job where the total supervisory force for a gang of approximately 120 men comprised one assistant roadmaster, one foreman and two assistant foremen, in spite of the fact that the operations were spread over more than a mile and a half of line most of the time. This example, while probably unusual, is indicative of other less forceful illustrations of inadequate supervision that can be pointed to and that are raising anew the problem of just what is adequate supervision.

If there are to be fewer foremen, or if foremen are to be burdened beyond their capacity to afford detailed supervision of the work under their direction, the answer may lie in providing more assistant foremen, because no maintenance officer questions the advisability and economy—even the necessity—of having the work of track forces adequately supervised by men who are thoroughly experienced in track work; who can co-ordinate the effort expended to the best advantage, who can accept responsibility and make decisions; and who know and will insist upon safe practices.

Rail Damage

What Are the Responsible Factors?

THE problem of rail damage is by no means new to maintenance of way officers, for they have studied it for years. Developments in recent years, however, especially in response to the public demand for higher speeds, have introduced a number of new elements which have gradually brought into more prominence the extent to which the mechanical department may be responsible for the damage, other than normal wear, which is being done to rail today with increasing frequency. In other words, both maintenance of way and mechanical officers are today giving increased attention to the causes of and remedies for rail damage, and while, quite naturally, there are differences of opinion, it is a healthy situation which should ultimately result in minimizing much of the damage to rail, with large savings to the railways.

Among the more important types of rail damage are abrasion of the head, flow of metal in the head, rail end batter, transverse fissures, rail burns, head corrugation and surface kinks or bends. These defects have become more common with high-speed operation as wheel loads have increased with little corresponding increase in wheel diameters; and as many of the older locomotives are being operated at speeds far in excess of those for which they were designed. Maintenance of way men also look upon long rigid wheel bases, corrugated and out-of-round wheels, and faulty car and locomotive spring suspension as contributing to the rail damage, and, to a greater extent than heretofore, are calling upon the mechanical department for aid in the solution of the problem.

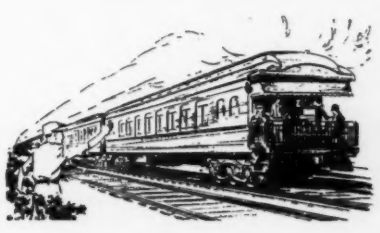
Most mechanical officers are showing a desire to co-operate, as is evidenced not alone by the study they are giving to this matter on individual roads, but also by the recent formation of a joint committee of representatives of the Engineering division (A.R.E.A.) and the Mechanical division of the Association of American Railroads, to conduct research on the relation between track and rolling stock. At the same time, in the expressions of many mechanical officers, it is not difficult to detect at least a degree of disturbance at their being brought so prominently into the rail damage picture.

Most mechanical men admit readily that rail abrasion on curves can be greatly reduced by the use of articulated wheel bases or other arrangements to permit the required lateral freedom of wheel movement; that flow of metal in the rail head and rail end batter can be minimized by lighter wheel loads, particularly on the smaller diameter wheels of tenders; that the development (not the cause) of transverse fissures may be stimulated as the result of excessive load concentrations on the rail; and that proper counterbalance and cross counterbalance are important in the avoidance of kinked or surface bent rails; but there seems to prevail among some mechanical men at least, a feeling that, except for adjusting the design of those locomotives which are especially hard on the track, the engineering and maintenance of way departments should build and maintain their track structures to withstand the abuses caused by modern train operation.

Evidence of this is seen in the comments of a mechanical man recently that safe operating speeds, as they effect the track structure, are, in the final analysis, governed by a combination of track conditions, including curvature, spiraling, super-elevation, line and surface, rail, crossties, ballast and subgrade, and not by motive power and rolling stock. In other words, he was making the point that the track is not as "fast" as present-day equipment, and that the fact that it "can't take it" is evidenced in a wide variety of rail damage.

Going a step further, this commentator raised questions regarding inequalities in the supporting power of the roadbed, with the increased wheel impacts resulting therefrom; the adequacy of the weight of rail being used; the age and spacing of ties; the amount and kind of ballast; the adequacy of surface drainage and subdrainage; and the maintenance of a sufficient degree of refinement in line and surface. In fact, turning the tables on the critics of motive power and rolling stock, he said, "a little track work in the way of putting more ballast under the ties in soft spots; smoothing the surface and line; and in draining the ballast and the subgrade to prevent ties from 'pumping', will frequently overcome track conditions that are detrimental to both the rail and equipment; the latter, particularly when operated at the present-day higher speeds."

So the question of rail damage, its causes and cures, still stands, but much clearer in its many aspects because of being brought out in the open. There is no question but that the problems involved in this question lie, not within the track structure alone, nor within locomotives and rolling stock alone, but rather in an adjustment of the factors involved in *both* the track and in locomotives and rolling stock, and that the solution of these problems will be found as the result of the closer co-operation now being encouraged and in the study of this subject.



Track Raised for Leveling Off Subgrade and Bunching Ties

Sub-Ballast

Faced with difficult track conditions resulting from soft spots in the roadbed at points where drainage is practically non-existent, the Missouri Pacific has for some time been studying the feasibility of using some form of sub-ballast support to give a more uniform distribution of the traffic loads to the subgrade. Tests of this form of support gave such promise of effectiveness that a major installation was undertaken involving 4,600 ft. of track. This article describes the conditions that were to be overcome, the plan for supporting the track and the methods of making the installation.

WITH most of its mileage lying in the valleys of the Mississippi river and its tributaries or across the plains of the Southwest, where soil conditions are frequently not of the best with respect to stability, and where drainage is often difficult or impracticable, the Missouri Pacific has had its share of trouble with soft spots in roadbed. In its efforts to stabilize the roadbed where these soft spots occur many methods have been resorted to, including principally drainage and the driving of piles and cull ties.

Experience has shown that cull ties are particularly effective in cuts and on embankments up to 3 or 4 ft. high. All told, from 1928 to the end of 1937, a total of 132 miles of soft spots had been stabilized by this method, with entirely satisfactory results. For embankments from 4 to 25 ft. in height, piles tied together across the track have been used with equal success. While the cost of driving the cull ties, and of the piles for embankments up to 20 ft. is reasonably low, where the height exceeds 20 ft., the cost mounts rapidly and soon becomes prohibitive, for experience has shown that to be effective the piles must penetrate well below the original ground line. A description of the methods employed in driving cull ties appeared on page 363 of the June, 1936, issue.

Trying Concrete Slabs

In its search for some suitable and economical method for stabilizing the roadbed that would not involve the driving of piles, precast concrete slabs, varying in length from 10 to 20 ft., and in thickness from 4 to 6 in., were installed between the roadbed and the ballast over a water pocket 110 ft. long at Halsey, Ill., in 1934. At this point the line lies on bottom land adjacent to the Mississippi river, and the embankment, which at this point is only 3 ft. high, is constructed of alluvial material that approaches gumbo in its characteristics. It was obtained from borrow pits adjacent to the toe of the fill, which, owing to the absence of drainage, contain water for long periods.

These conditions were ideal for an unstable embankment and a water pocket formed, which at the time the slabs were installed had reached a depth of 15 ft. below the track. As a result, extreme difficulty had been experienced in keeping the track in condition for the passage of trains at full speed.

The theory of this form of sub-ballast support was that it would distribute the traffic loads uniformly to the subgrade, both laterally and longitudinally, and thus keep the unit pressure on the subgrade well within the limits of safe loading. Experience showed that not only was this theory sound, but that the slabs formed a blanket that prevented water from the pocket from working up into the ballast, thus eliminating pumping of the ties.

This line of the Missouri Pacific extends from East St. Louis, Ill., to Thebes, 126 miles, following the east bank of the Mississippi river for the entire distance. In general, the line is located on bottom land, although at places it is supported on the foot of the bluffs where they crowd closely upon the stream. The unstable character of the soil has created numerous difficulties with respect to track maintenance, not the least of which has been the formation of water pockets at a number of points.

Trouble at Jones Ridge

One of the most troublesome of these is located at Jones Ridge, about 12 miles south of Chester, where a water pocket extended for the full length of an embankment 4,600 ft. long. The embankment varies in height from 6 to 12 ft., the material of which it was constructed being similar to that at Halsey, while, owing to similar topographical conditions, drainage of the borrow pits is impracticable.

Extreme difficulty had been experienced in keeping the track in line and surface. In fact, it was necessary to go over it an average of three times a week, and slow orders were frequent. Additional ballast had been applied from time to time to restore the track to its original elevation, and the embankment had split and bulged at several places, while slides had occurred at others.

In view of the satisfactory performance of the test slabs at Halsey, it was decided to make a similar installation at Jones Ridge. In this case,

Slabs Cure Unstable Roadbed

By A. A. MILLER
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however, the slabs were reduced to a single size, 10 ft. by 12 ft. by 6½ in. at the center and sloping to 5½ in. at the edges, to insure drainage toward the shoulder of the roadbed. Reinforcement consisted of ½-in. round bars spaced 12 in. at the top and bottom longitudinally, with 6-in. spacing on the bottom and 12-in. at the top laterally. Each slab contained 2.22 cu. yd. of concrete. The slabs, 260 in number, were cast by this road at Little Rock, Ark. A relatively dry mix was employed, the concrete being vibrated to obtain maximum strength. About three hours after the concrete was deposited the top surface was given a coat of emulsified asphalt to reduce moisture losses during the curing period.

Placing the First Slabs

The slabs were made during the late summer and early fall of 1936 and were all shipped on flat cars, in a single train, together with a locomotive crane, to the site of the work. Two cranes were employed in the unloading and one for the placing of the slabs, a maximum of 80 slabs being placed in a single day, during which the actual working time aggregated 5 hr. 20 min., an average of one slab every 4 min.

An extra gang of 35 trackmen and a bridge foreman, with 3 men from his gang, placed the slabs in position. Line and grade stakes had been set previously for the double purpose of determining the amount of excavation that would be necessary and for surfacing the track after the slabs were in place.

All work was carried on progressively, temporary runoffs being provided, as necessary, for the passage of trains. After the slabs were in place the old ballast was thrown back into the track and used for the first lift, 4 in. of ballast under the ties being required before trains were permitted to proceed. However, the 25-ton locomotive crane was allowed to run over the track, while the ties rested directly on the slabs. It required 16 hr. to unload the slabs and 23 hr. actual working time during 4½ days to place them, or an average of slightly more than 5 min. to each slab. During the period of the work it was necessary to clear from 2 to 6 trains a day. These slabs were placed late in November, 1936, and it was about December 1 that the track was given its final surface and line.

They Stand Up

Despite the fact that this is the heaviest traffic line on the Missouri Pacific, the normal schedule including from 40 to 50 trains a day, and despite the further fact that during the Ohio River flood in January and February, 1937, a large amount of traffic from other roads was routed over this line, little maintenance has been necessary. In fact, to May 1 this year, a period of 17 months, the cost for surfacing and lining has been less than $60.

In view of the benefits derived from the first slabs installed, it was decided to complete the job, and during the late summer and early fall of 1937 the remainder of the slabs were constructed. However, experience with the first lot indicated that a slight change in dimensions was desirable since it was impracticable to stake cars containing slabs 10 ft. wide. Accordingly, the width was changed to 9 ft., other dimensions remaining the same, and 225 slabs of this size were constructed. The only other change was a shift in the position of the lifting loops, which are 2 in. off center to facilitate the placing of the slabs under the track. The installation of these slabs will be described in somewhat more detail.

Owing to the more secure loading, it was not necessary to supervise the movement so closely as with the former lot, and they were shipped in revenue trains. As soon as they arrived they were unloaded on the slope of the embankment as nearly opposite

Above — Sliding Slab Under Track—Below —Making the Hitch on the Inside of the Rail

The Slab in Place, Ready to Release the Hitch

the point of use as practicable, in fact, at no time was it necessary for the placing crane to make an unusual reach to secure any of them.

In the meantime a profile had been prepared with the view of reducing the amount of excavation required. The fact that the track in this stretch had settled somewhat below its normal elevation was of some assistance in this respect, since it was not desired to raise the track above this elevation more than was necessary to facilitate the placing of the slabs.

Placing the Second Lot

The first installation had been completed up to a pile trestle and the second was to start at its north end. Here the excavation amounted to 14½ in. to provide for 8 in. of ballast and the 6½-in. depth of the slab. Beyond this point, by raising the track slightly more than 1 ft. above the existing elevation of the rail, it was restored substantially to its former elevation and the excavation was reduced to cribbing and leveling off the old ballast to provide the necessary bearing for the slabs. At the north end, however, where a junction of the new grade with that of the undisturbed track was necessary, the excavation again amounted to 14½ in. as at the point of beginning.

Compared with the setting of the first slabs, the force consisted of a bridge foreman, three bridgemen, an extra-gang foreman and 25 men. In both cases the crane crew consisted of a craneman, a fireman, two laborers and a foreman. The function of the latter was to care for the blocking and stripping of the slabs after they were placed.

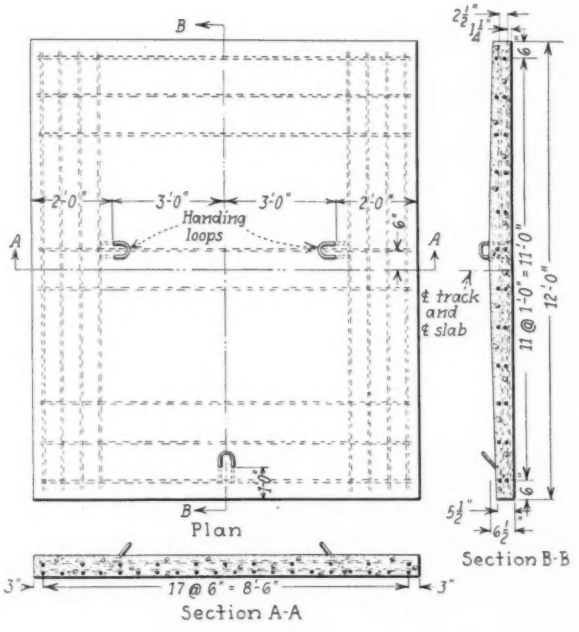
Preceding the actual setting of the slabs, the extra gang cribbed the track, raised it on jacks 16 in. and inserted two short 8-in. by 8-in. blocks every 27 ft. (this spacing was 30 ft. in the first installation), after which the subgrade was leveled to the proper elevation. The load line of the crane was then attached to the three lifting loops of the slab by means of a bridle, the rear loop being used only to balance the slab as it was swung into the clear, this being necessary because the two main loops were placed 2 in. off center. The slab was then swung to the shoulder of the roadbed in position for sliding under the track and the rear hook was detached.

Sliding Them to Place

The slab was then lifted slightly and slid under the blocked-up track until the bridle lines fouled the rail. The hitch was then released and the hooks were slipped under the rail from the inside of the track and again attached to the loops, after which the slab was slid to final position, abutting tightly against the preceding slab. Prior to placing the slabs the ties had been shifted alternately at 4 and 5½-ft. intervals to provide room for shifting the slab longitudinally as it was placed, to make it easier to handle the hitches and to facilitate the burning of the loops.

Obviously, the purpose of placing the lifting loops off center was to raise the forward end slightly as the slab was slid into place, while the rear end dragged on the shoulder. This plan was quite effective and saved much time, since the slab moved easily into place and was lined quickly to the stakes that had been set at short intervals for this purpose.

Plan and Sections of Slabs, Showing Dimensions and Reinforcing Details



The Slabs in Place, Ready for Ballast

As soon as the slab was landed, one of the bridgemen cut off the loops with an oxyacetylene torch. The two men who accompanied the crane placed 6-in. blocks under the ties near the forward end of the slab to hold the track up over the rear end of the next slab. They also placed 1-in. plank longitudinally under the ties to give better distribution of the load imposed by the crane and later by the ballast cars and to take the bearing off the center of the ties. The crane then moved forward 9 ft., the length of one slab, always setting the third slab ahead. This completed the cycle, the crane reaching immediately for the next slab.

It has been mentioned that in the previous installation 80 slabs, covering 800 ft. of track, were placed in 5 hr. 20 min., or at the rate of one every 4 min., while the average time for the entire installation was slightly more than 5 min. In the present installation, 101 slabs, covering 909 ft. of roadbed, were set in one day of 3 hr. 50 min. actual working time, or at the rate of one every 2.2 min. On the last day, 51 slabs were set in 1 hr. 45 min., or at the rate of one slab every 2 min.

Following closely behind the crane, chatts was unloaded in sufficient quantity to raise the track 8 in. above the slabs. The old ballast was not used in this installation, largely because there was an insufficient amount owing to the greater settlement of the track on this stretch.

What It Cost

Figures are not yet available as to the cost of transporting and setting the second lot of slabs. However, the cost of transportation should be the same in both cases, since the shipments originated at Little Rock and terminated at Jones Ridge. The cost of the track work and the placing should have been less in the second installation since a smaller track gang was employed and the time required for setting was reduced. However, advancing prices of material increased the cost of the slabs themselves, these costs being $2.68 per track foot in 1936 and $2.95⅜ in 1938.

	Cost per foot of track
Manufacturing and loading the slabs	$2.68
Unloading and placing	0.54
Skeletonizing, blocking track and leveling subgrade	0.34
Surfacing and dressing track and subgrade	0.52
Total	$4.08

Keeping these differences in mind, the cost of the first installation was as shown in the table at the bottom of the preceding column.

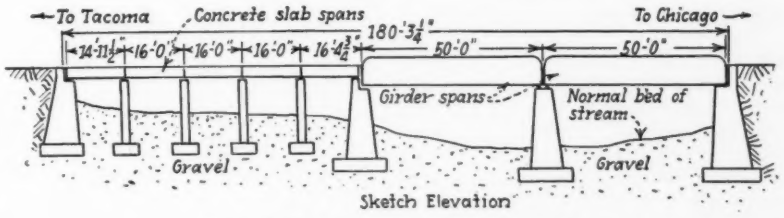
A recent examination of the slabs in the first installation indicates that there has been no displacement of any of them by reason of settlement or shifting, and that none of them have been broken or cracked by the traffic loads or uneven bearing on the subgrade. It is believed that the width, 12 ft., is ample to give the desired bearing, for there is no evidence that the subgrade has been overloaded at any point or of movement of the material comprising the roadbed, although considerable water has stood in the adjacent borrow pits almost continuously since the day that the slabs were set in place.

Both the original test and the two installations at Jones Ridge were made under the direction of the writer. The slabs were designed by F. E. Bates, bridge engineer, and constructed under his direction. The installation and the incidental trackwork were carried out by P. P. Wagner, division engineer.

Cloudburst Undermines Bridge in Montana—47 Lives Lost

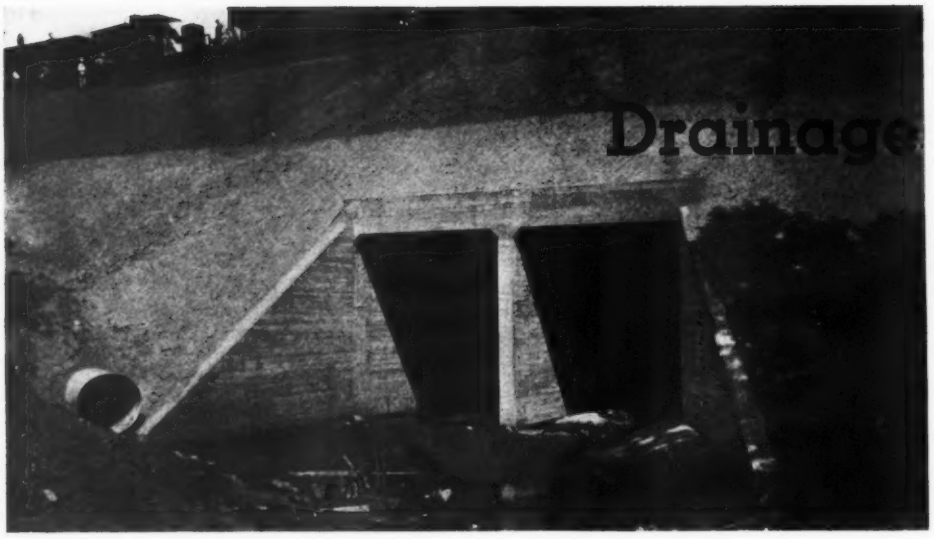
THE westbound Olympian, fast Chicago-Seattle train of the Chicago, Milwaukee St. Paul & Pacific, plunged through a single-track bridge into flood water of Custer creek east of Saugus, Mont., shortly after midnight on the morning of June 19, resulting in the death of 47 persons, and the hospitalization of 65. Prior to the accident, the train had not passed through any storms. A track walker had passed over the bridge where the accident occurred a short time prior to the arrival of the train, noting nothing unusual about the bridge or the stream, which was nearly dry at the time. The storm which caused the damage occurred about 20 miles distant in the upper sources of Custer creek, where rain of cloudburst proportions fell, the resultant torrent weakening the bridge.

The bridge in question is located on a stretch of tangent track. It was a steel and reinforced concrete structure consisting from east to west of two 50-ft. through plate girder spans on a concrete abutment and two piers, and five 16-ft. spans of precast reinforced concrete slabs on smaller concrete piers. The piers and the abutments were supported on spread footings resting on a firm gravel foundation well below the normal bed of the stream, and the bridge opening beneath the girder spans over the main channel had a maximum height of approximately 16 ft. The stream, which has a wide shallow bed and is normally dry nine months of the year, drains a rolling hilly area of approximately 133,000 acres extending approximately 25 miles upstream. The physical characteristics of the region are such that in severe storms an unusually rapid run-off results in a quickly swollen stream and in the design of the railroad bridge over Custer creek this fact had been considered.



Sketch Elevation of the Custer Creek Bridge

What actually happened when the train started over the bridge is a matter which may never be entirely established, but preliminary indications are that the swift current of the swollen stream had undermined the first pier from the east end of the bridge and the resulting settlement under the engine of the train caused the derailment and the destruction of the bridge.



The Double Box Culvert Which Replaced the Bridge Opening, Showing Also the Outlet of the Pipe Sub-Drainage System

Drainage System

Because of distortion of a steel viaduct resting on unstable foundations, the Burlington decided last year to replace the structure with an embankment. However, circumstances attending the initial work on this project indicated the probability of serious distortion of the structure while it was being filled. This article describes how such difficulties were avoided by a drainage system and compacting of the fill while being placed.

SUBSOIL drainage and solidification methods in the placing of an embankment overcame an exceedingly troublesome situation at a bridge on the Chicago, Burlington & Quincy near Fairfield, Iowa. The successful outcome of the corrective measures proved a source of keen satisfaction because they were effective in removing a slow order of long standing and the necessity for extraordinary attention to a bridge on footings of limited stability.

Bridge No. 259.52, located about 4 miles west of Fairfield, on the Chicago-Omaha main line was a double-track plate girder structure about 300 ft. long, supported on two pocket abutments, two concrete piers and two steel towers. It served as the crossing of a creek that lies about 54 ft. below track level at the foot of rather steep slopes from both the east and the west. Approach embankments are supported on these slopes for some distance back of the two abutments. All units of the substructure were placed on piles that were driven into gray and yellow clays and in some cases into underlying shale, the surface of which slopes toward the bed of the creek.

Trouble of Long Standing

This bridge was the source of concern for many years owing to the progressive movement of the clay overburden and fill material on the sloping surface of the shale on the west side of the creek, where the presence of water rendered the overburden unstable and lubricated the surface of the shale. This water percolated through the roadbed from a cut west of the creek valley and from a small draw that intercepted the right of way near the east end of the cut. These conditions resulted in lateral sloughing of the fill as well as a longitudinal movement of the clay down the side of the valley. With the dumping of cinders and other material for the purpose of restoring the roadbed to normal elevation, water pockets were formed that increased the instability of the embankment and the clay subsoil, which carried the west abutment, pier and tower pedestals with them as they moved toward the creek.

This movement was slow, but was of sufficient magnitude to require the cutting of anchor bolts connecting the steel to the masonry for the purpose of blocking up the towers on the pedestals and the girders on the pier and abutment bridge seats, and to allow the steel to move westward to compensate for the displacement of the substructure. By the summer of 1936 this movement had gone so far that the bases of the tower legs were flush with the west edges of the pedestals, and by the time that the corrective measures described below had been completed the west abutment had settled three feet. In addition, the west end of the viaduct had moved about a foot to the north.

Decided to Fill the Bridge

In the face of this situation it was decided to replace the bridge with an embankment, providing a double 14-ft. by 17-ft. reinforced concrete box culvert for the creek. An interesting innovation in the construction of this box was the placing of galvanized sheet metal pipe sleeves around the side-wall form bolts so that the removal of the bolts provided a series of weep holes through the walls. However, the excavation for the construction of this culvert had the effect of removing the base support for the mass of unstable clay, with the result that the movement became so serious that it became necessary to support the west half of the superstructure on falsework. Double bents of 10 piles each were driven on each side of each of the tower bents. Twelve 8-in. by 16-in. stringers were then placed across the tops of these bents, with their tops just clear of the bottom flanges of the cross girders, which were wedged up on them.

In view of the unstable condition of the ground, there was every reason to anticipate trouble with any fill placed on it, regardless of how thoroughly it was compacted, but of even greater concern was the possibility of serious distortion of the steel towers while the fill was being placed. The filling was therefore postponed, pending a survey of the situation.

Solves Serious Bridge Filling Problem

Extensive borings developed the conditions revealed in the longitudinal section, which shows strata of wet and saturated materials, and from a study of these it was concluded that it would be unwise to place the fill until an effective subsurface drainage system had been installed.

The first step was to sink 10 shafts 30 ft. apart in a line outside the south toe of the proposed fill for a distance of about 300 ft. west from the bed of the creek. These shafts, 6 ft. by 3 ft. in section and curbed with timber, were excavated to depths of as much as 37 ft. to insure that they were carried well below the bottom of the saturated strata. Following this a tunnel, started at the creek channel, was driven in a westerly direction so as to intercept the bottom of each shaft. This tunnel was made large enough to permit the placing of a 36-in. corrugated perforated pipe inside it.

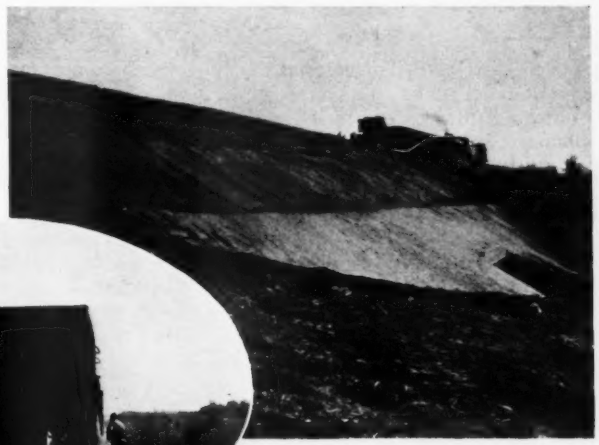
In addition, eight-inch corrugated perforated pipes were placed by the tunnel method from each shaft, under, and approximately at right angles to the track and at a slight up-grade. Some of these laterals were as much as 80 ft. long. They were backfilled with gravel. After this work had been completed, the shafts were also filled with gravel.

Ground Soon Drained

The discharge from this drainage system increased progressively as the work proceeded, but as there was little rainfall in the weeks immediately following the completion of the drains, the flow soon diminished to little more than a trickle, indicating that most of the water had been removed.

Supplementing this work, five French drains were installed in the berm that had formed at the foot of the slope on the north side of the bridge as a result of the lateral movement of the old fill. The trenches for these drains were made as wide as the drag-line bucket that was used to excavate them and were back-filled with brick bats. In addition to these measures, the flow through the roadbed from the cut was intercepted by installing a 24-in. reinforced concrete culvert pipe where it would be effective for this purpose and also take the discharge from a small draw south of the track. The side ditches in the cut were cleaned out and a ditch was cut to divert the discharge from the culvert away from the approach embankment.

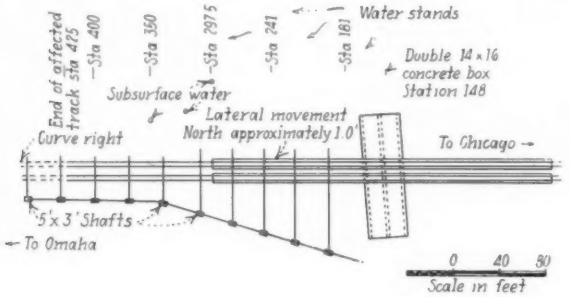
The embankment for the filling of the bridge was constructed with a 38-ft. subgrade width, 1½ to 1 slopes, and 10-ft. berms on each side at an elevation 21½ ft. below top of rail. A total of 36,000 cu. yd. of material was required, of which 9,000 cu. yd. was obtained from ditching operations. The ditching train embraced two shovel-type ditchers and four 30-yd. side-dump cars. The remainder of the fill was sand from a pit at Gladstone, Ill., involving a haul of about 65 miles in trains of 35 hopper cars loaded with about 35 cu. yd. each.



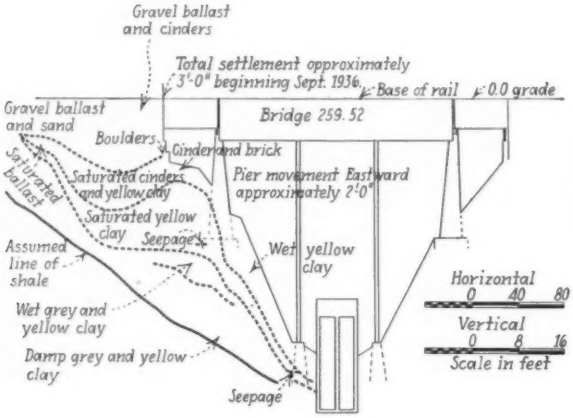
Right—The Fill as Practically Completed, Showing Its Rip-Rapped Base

Insert—Unloading From Hopper Cars. Left—Spreading the Fill in Layers

The fill was spread, formed and solidified by the J. P. Abramson Construction Company, Des Moines, Iowa, under a force account contract. Two Koehring dragline machines, one on each side of the bridge, were used to distribute the material as it was dumped from the cars, while a Caterpillar tractor, equipped with a bulldozer, spread it in layers not exceeding two feet in thickness.



Situation Plan Through the Area of Roadbed Disturbance



Profile of the Bridge, Showing the Adjacent Soil Conditions and the Location of the New Double Box Culvert

Use 6,500 Gal. of Water Daily

Solidification was further assured by wetting the fill as it was placed. The contractor obtained water from the creek with a C.H.E. truck-mounted triplex pump, operated by a gasoline engine, that delivered it through a 2½-in. pipe laid along the ends of the ties on the bridge. Four hose lines were run from this pipe, two being used to spray water over the fill on each side of the structure and the other two for jetting around the tower columns, and next to the faces of the piers and abutments. The consumption of water averaged 6,500 gal. per day.

These measures for solidifying the embankment were suspended at the level of the bottom flanges of the girders to avoid excessive difficulty in pulling the girders out, although the fill was necessarily carried up to the base of rail before this was done. When the fill reached the underside of the girders, the nuts were burned off the bolts connecting them to the tops of the columns and to the shoes on the masonry bridge seats, but the bolts were left in place with the heads on top. All bracing except the top lateral system was also flame-cut with acetylene torches and removed.

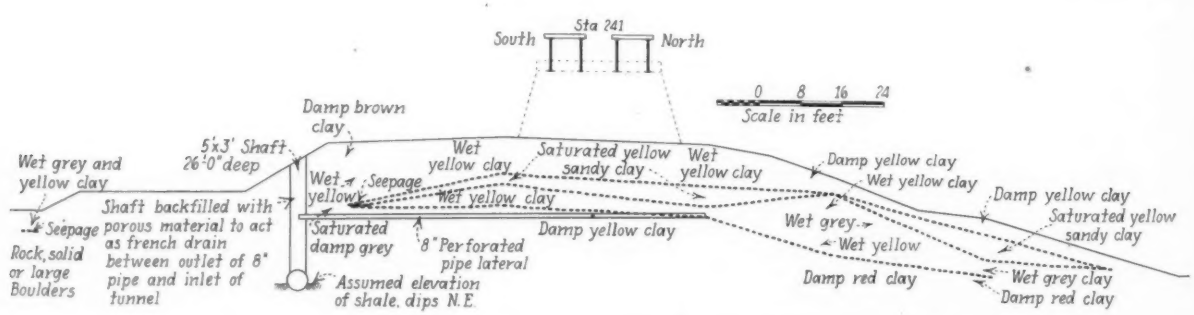
Salvaging the Girders

The girders were removed, one at a time (after the top laterals were cut), by means of two cranes, one at each end. One crane operated on the track under which the girders were being removed, backing up as this track was taken up to permit the steel to be pulled, the other crane advancing on the opposite track. As rapidly as this work progressed the tractor with the bulldozer bladed the roadbed to standard contour, while the jets were used to solidify the fill flush to the surface. The track was then relaid, and after dumping additional sand to fill out any low or narrow places, ballast was applied and the track surfaced.

To carry out this last phase of the project, each track was taken out of service in turn for about four days—two days for the removal of the girders and the finishing of the roadbed, and two more days for the relaying and surfacing of the track. As a further measure of security, the slopes of the embankment were riprapped with stone from the ground level to an elevation one foot above the top of the culvert.

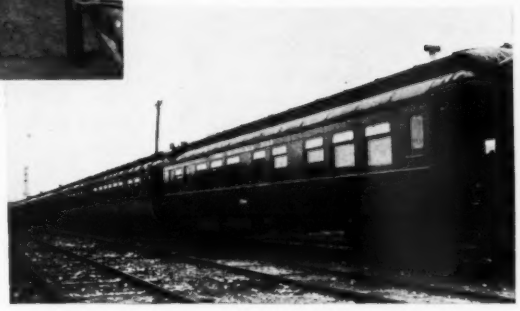
The drainage system, which involved the use of Armco pipe, was planned and built by the Drainage Engineering Company, Middletown, Ohio. The work was started on July 15 and completed on August 17. The placing of the fill was started on August 5 and the tracks were placed on the new embankment after the removal of the girders, early in September.

The project was carried out under the direction of F. T. Darrow, chief engineer of the Chicago, Burlington & Quincy. A. E. Beecher was resident engineer. The design of the culvert and the measures for safeguarding the bridge were developed under the supervision of G. A. Haggander, bridge engineer of the road.



Cross Section of the Roadbed at Station 241, Showing the Sub-Soil Conditions and Pipe Drainage System Installed

Milwaukee Provides All-Steel Camp Cars



Right—A Camp Train of the Converted Passenger Train Cars. Above —The Interior of One of the Bunk Cars

While the Chicago, Milwaukee, St. Paul & Pacific has always maintained high standards with respect to its mobile labor camps, it was able to make a marked improvement in the housing conditions for several of its larger gangs when all-steel sleeping and dining cars and coaches were made available. This article describes one of these camps, typical of the remainder, after the new equipment was placed in this service.

FOR SOME time the Chicago, Milwaukee, St. Paul & Pacific has been replacing its older passenger cars with more modern, light-weight, streamlined and air-conditioned cars. In pursuance of this policy the equipment thus released was slated for retirement. This afforded an opportunity which the maintenance of way department was quick to grasp, to improve the camp-car equipment for some of its more important system gangs. Accordingly, the released all-steel cars were secured for this purpose.

It has long been the policy of the Milwaukee to keep its camp-car equipment to a high standard. In pursuance of this policy it has from time to time converted retired passenger cars into camp cars as they became available. Obviously, however, the supply of retired passenger equipment has always fallen far short of the demand for it. For this reason, as retired passenger cars became available, they have been assigned first as kitchen and dining cars and for sleeping and office quarters.

In view of the large number of system gangs which the Milwaukee employs for laying rail, ballasting, renewing ties, surfacing and other maintenance requirements, the number of retired passenger cars in use represented only a relatively small part of the total requirements for housing track labor. In addition, it has been necessary to provide camp equipment for carpenter, pile driving, concrete, structural steel, signal and telegraph gangs, to enable them to be completely mobile. Obviously, in the main, it has been necessary to resort to box cars for housing the men engaged in track maintenance and to almost as large an extent for those employed as structural forces. To do this has required approximately 600 box cars for the track forces and 750 for the bridge and building and signal forces, these requirements varying somewhat with the season and to some extent from year to year.

In addition to the well-recognized drawbacks to the use of box cars for housing purposes, including the difficulty of providing proper ventilation, the high interior temperatures which develop during the summer months, the difficulty of heating during cold weather and the amount of effort required to keep them clean and sanitary, the further fact that only a limited number of men can be accommodated in a box car made it difficult at times to find track room for camps serving gangs of from 75 to 350 men.

These gangs are able to progress at the rate of 1 to 3 miles a day, and occasionally even more rapidly, so that the usual expedient of laying a temporary track and cutting the camp out onto it has been impracticable. Usually these camps have occupied established sidings, but these have not always been available, with the result that it has been necessary at times to haul the men considerable distances.

A Typical Camp

For a number of years the Milwaukee has maintained a system gang for laying rail. This gang, typical of the larger gangs on this road, normally consists of about 175 men during the working season. When the all-steel equipment became available, 15 of the cars were assigned to the rail gang. They were sent to the company's shop at Milwaukee where all of the interior fittings were removed, except as will be noted later. The cars were then completely rewired for 110-volt lighting circuits, and new water lines were installed to serve the toilet facilities that were to be provided and to supply water to the kitchen car. It is of particular interest that the coupling of the water lines between cars is made with air hose, which insures that the connection will not be

broken when the cars are being moved.

One of the retired observation cars became available and it was fitted up as living quarters for the general foremen in charge of the gang. Only the toilet and washroom were retained in this car, the latter being converted into a dressing room. Partitions were erected to provide a kitchen, a dining room, two bedrooms, bathroom and a living room.

The Passenger Equipment Made Light and Airy Camp Dining Cars

Four Dining Cars

One of the dining cars was converted into a kitchen car, such of the original kitchen equipment as was suitable being retained, while other items needed were added. Four sleeping cars were converted into dining cars, one of which is used by the foremen and assistant foremen, while three are used for serving the men in the gang. Another sleeping car provides an office for the camp steward and space for a commissary, as well as living quarters for the kitchen force and waiters. Seven additional sleeping cars were utilized as bunk cars for the men.

In fitting up the four diners, the only fixed equipment to be installed was two stoves, one at either end of each car. Removable tables and benches to accommodate 60 men were placed in each of the three cars used by the men. Similar accommodations, although on a somewhat smaller scale, are provided in the foremen's dining car.

In fitting up the bunk cars, not only were the berths removed, but also the washroom facilities, the toilets and the partitions which enclosed them, leaving the interior of the car entirely free of obstructions. Six wash basins were installed, and a stove was placed at each end, in each car. Double-deck steel bunks and lockers, to accommodate either 28 or 32 men, were then placed in each car. This left relatively wide aisles which, together with ample windows and freedom from obstructions to the circulation of air, permits satisfactory ventilation and quick cooling of the cars after nightfall, even though they may have been closed during the day. Similarly, the sleeping quarters of the foremen and of the kitchen force and waiters were left open to insure the best practicable ventilation.

The Kitchen Car

A zinc-covered work and serving table extends the full length of one side of the kitchen car, with open shelving, enclosed cupboards and drawers beneath the working top for supplies and kitchen equipment. Four sinks and two drain boards are also built in at one end on the opposite side of the car. This car also contains three ranges with ovens and one separate baking oven for bread and pastry. In addition there are three hot-water tanks, an electric dishwasher, a dough mixer and a potato peeler.

Other cars in this outfit include a special car for non-perishable provisions; a special refrigerator car for perishables; material, equipment and tool cars; and a car equipped as a machine shop for repairing tools. This latter car contains an oxy-acetylene torch, an electric drill, a grinder and other power tools, and an anvil and forge. In addition, cars are provided for the water and power supply, a special tank car being used for water-supply purposes.

The power car contains a pump and pressure tank, the former being connected to the water supply cars from which it pumps the water into the pressure tank for distribution to the cars. No provision is made for cooling the water in any of the bunk or living cars, but a sufficient amount of ice water is kept in the kitchen and dining cars to meet all demands for drinking purposes. This car also contains a generator set for producing the lighting and power current.

In addition to the facilities for housing and feeding the men, which have already been mentioned, still further arrangements are being made to add to their comfort and increase the sanitary level of the camp. One of the express cars was fitted up as a bath car, with hot and cold water showers and dressing room to replace the more primitive facilities for bathing. Another of the express cars has been converted into a toilet car, which replaces the old portable privies.

When the gang moved into the new cars, the old equipment was inspected carefully to determine what disposition should be made of it. The old observation car, the kitchen car and the diners were sent to the shop for reconditioning, after which

This Well-Equipped Camp Kitchen Car With Four Sinks and Four Ovens, Was Formerly in Regular Dining Car Service

they were assigned to some of the other gangs. The suitable box cars were distributed among other gangs, where they replaced cars that were slated for retirement. All of the steel underframe box cars in the outfit were retained and are being used for purposes which have been mentioned.

One of the immediate results of this change in equipment is that the men are now able to remain in their own cars when the camp is being moved. Previously, it had been necessary to furnish regular passenger equipment for the men every time a move was made, except when moving the camp merely to advance it in keeping with the progress of the work, this being done while the men were out of the cars during working hours.

The camp is operated by the Olympia Commissary Company, under the supervision of the maintenance officers of the Milwaukee. This company provides the bedding, the food, the kitchen and dining car employees and janitors, and boards the men and cares for the cars. Three foremen are assigned to have charge of the men while they are in camp and to look after the operating and sanitary details. The kitchen force consists of 1 chef, 1 second cook and 3 helpers, while 4 waiters are assigned to the dining cars.

All occupied cars are screened, at both doors and windows. When the camp is set out at any point, cesspools are constructed to take the drainage from the kitchen, bunk and bath cars, the kitchen garbage being disposed of independently. Three janitors are employed by the commissary company to care for the camp. They are required to make the beds and sweep and scrub every car every day. They are also held responsible for all outside sanitary conditions.

While the same difficulties are not experienced with respect to infestation with vermin as with the older box-car equipment, since the all-steel cars do not contain crevices and other spaces suitable as hiding places for bugs, mice, etc., it has been found that fumigation is necessary also. Accordingly, fumigation is resorted to at regular intervals to destroy these pests.

The camp which has been described is under the direct supervision of Wm. Moberly, roadmaster, who is in charge of the rail gang. The general plan of the camp and its management have been worked out under the direction of Wm. Shea, superintendent of track maintenance.

Wood Preservation Makes Further Gain in 1937

WOOD preservation continued in 1937 the gains which have been progressive since 1934, a total of 265,794,186 cu. ft. of timber having been given preservative treatment during the year, an increase of 43,330,192 cu. ft., or 20 per cent, over the quantity treated in 1936, according to figures compiled by R. K. Helphenstine, Jr., Forest Service, United States Department of Agriculture, in co-operation with the American Wood-Preservers' Association. While this volume is only 73.4 per cent of the quantity treated in 1929, the peak year for the industry, it has been exceeded in only 7 of the 29 consecutive years that these figures have been compiled.

Six of the eight classes of material treated showed increases last year compared with 1936, while two, piles and construction timbers, decreased slightly. The largest increase quantitatively was in ties, the gain in this classification having been 20,553,330 cu. ft., or 18 per cent. Relatively, the largest increase was in miscellaneous material, which gained 4,143,182 cu. ft., or 46 per cent. Poles showed the second largest increase, both quantitatively and relatively with a gain of 19,331,365 cu. ft., or 35 per cent.

As in previous years since the beginning of the wood-preserving industry, the railways maintained their position as the principal consumers of treated timber. Thus the volume of crossties alone represented 50.5 per cent of the total amount of timber treated, while crossties and switch ties combined made up 54.1 per cent of the total. These figures by no means represent the total amount of treated timber consumed by the railways, for they also use large quantities of the materials in other classifications.

Treatment of Miscellaneous Material (Ft. b.m.)

	1937	1936	1935	1934
Lumber	118,258,910	73,694,898	49,705,675	42,879,728
Fence posts	15,985,256	12,266,798	9,564,829	8,462,601
Tie plugs	870,486	1,238,326	1,332,533	2,092,863
Crossing plank	1,379,114	1,364,035	290,059	135,006
Car lumber	137,544	148,332	227,826	506,552

44,803,239 Crossties Treated

A total of 44,803,239 crossties were given preservative treatment in 1937, representing a total volume of 134,409,717 cu. ft. Numerically the increase was 6,851,110 ties, or 15.4 per cent. As was the case in 1936, oak ties ranked first in the number treated, with a total of 17,114,971, or 38 per cent, southern pine being second with 12,498,851, or 28 per cent, while Douglas fir stood third with 4,555,863 ties, or slightly more than 10 per cent. Other woods represented were gum, lodgepole pine, ponderosa pine, maple, birch, tamarack, beech, hemlock and elm, in the order named. All other woods aggregated only 905,-

Crossties (Number) Treated by Kinds of Woods and Kinds of Preservatives—1937

Kind of Wood	Creosote [1]	Creosote-petroleum [2]	Zinc Chloride [3]	Wolman salts	Zinc-meta-arsenite	Miscellaneous preservatives	Total	Per cent of total
Oak	14,075,451	2,992,571	33,115	3,834	.....	10,000	17,114,971	38.20
Southern pine	9,121,154	3,308,462	55,305	8,430	5,500	.....	12,498,851	27.90
Douglas fir	300,431	4,157,387	72,831	3,651	.....	21,563	4,555,863	10.17
Gum	1,764,838	442,613	.....	858	.....	.....	2,208,309	4.93
Lodgepole pine	.....	1,396,725	178,491	.....	.....	.....	1,575,216	3.52
Ponderosa pine	11,825	1,484,219	47,755	.....	.....	.....	1,543,799	3.45
Maple	489,164	777,616	239,498	.....	.....	5,000	1,511,278	3.37
Birch	277,189	543,754	210,707	.....	.....	2,000	1,033,650	2.31
Tamarack	212,697	387,318	215,359	.....	.....	.....	815,374	1.82
Beech	277,679	320,749	210,000	.....	.....	3,000	811,428	1.80
Hemlock	.....	.....	140,165	.....	.....	8,000	148,165	0.33
Elm	10,000	70,589	.....	.....	.....	.....	80,589	0.18
All other	389,520	376,777	11,578	.....	.....	127,871	905,746	2.02
Total	26,929,948	16,258,780	1,414,804	16,773	5,500	177,434	44,803,239	
Per cent of total	60.10	36.29	3.16	0.04	0.01	0.40	100.00	100.00

[1] Includes distillate coal-tar creosote, solutions of creosote and coal tar, water-gas tar and water-gas tar solution.
[2] Includes various percentages solutions of creosote and petroleum.
[3] Does not include chromated zinc chloride.

746 ties, or 2 per cent of the whole number treated.

Of the total ties treated last year, 26,929,948, or 60 per cent, were treated with straight creosote; 16,258,780 ties, or 36 per cent, were treated with creosote-petroleum mixtures; and 1,414,804 ties, or 3 per cent of the total, were treated with zinc chloride; while 199,707, or 0.45 per cent were treated with miscellaneous preservatives. All crossties treated in 1937 were subjected to pressure processes. Of the total number of crossties treated during the year 30,962,608, or 70 per cent, were bored and adzed before treatment; 2,104,043 were bored but not adzed; 650,264 were adzed but not bored; while 11,086,324, or approximately 25 per cent of the total were neither adzed nor bored.

The quantity of switch ties given preservative treatment in 1937 amounted to 115,377,605 ft. b.m., representing a gain of 12,148,284 ft. b.m., or 11.8 per cent, over 1936. Here also, oak was in first place with respect to the volume treated, the total for this wood being 63,041,601 ft. b.m., or 55 per cent of all switch ties treated. Southern pine regained second place, with a total of 18,854,988 ft. b.m., or 16 per cent; while Douglas fir, with 17,174,267 ft. b.m., or 15 per cent, returned to third place. Maple accounted for 6,042,671 ft. b.m., or slightly more than 5 per cent, and gum for 5,681,894 ft. b.m., or slightly less than 5 per cent. The remaining 4 per cent was made up of tamarack, ponderosa pine, beech, birch, elm and lodgepole pine, in the order named.

A decrease in the piling treated was registered, from 19,119,278 lin. ft. in 1936 to 17,697,920 lin. ft. in 1937, a reduction of 1,421,358 lin. ft., or 7 per cent. Southern-pine piles ranked first with 13,480,298 lin. ft., or 76 per cent of the total; Douglas fir was second, with 3,348,398 lin ft., or 19 per cent; and Norway pine was third with 406,321 lin. ft. The remainder, 462,903 lin. ft. consisted principally of oak and lodgepole pine, with a small amount of western red cedar and cypress. All piles treated in 1937 were impregnated by pressure processes, and all but an insignificant number were treated with creosote or creosote mixtures.

During 1937, the wood-preserving industry consumed 183,574,581 gal. of creosote, an increase of 28,861,582 gal., or 19 per cent, compared with 1936. This consumption has been exceeded only in each of the five years from 1926 to 1930, inclusive, and was only 43,000,000 gal. below that of 1929, the peak year in wood preservation. The consumption of foreign creosote increased about 5 million gallons, to 35,225,781 gal. The consumption of zinc chloride (3,591,381 lb.) and chromated zinc chloride (1,242,554 lb.) together amounted to 4,833,935 lb., an increase of 706,049 lb., compared with 1936.

Indicating a growing use of creosote-petroleum mixtures, the wood-preserving industry consumed 26,360,013 gal. of petroleum in 1937, an amount that has been exceeded only twice, in 1929 and 1930, the peak years of wood preservation, during the 14 years that statistics of petroleum consumption have been compiled. In this year's report, Wolman salts (989,691 lb.) and zinc-meta-arsenite (330,080 lb.) have been segregated from miscellaneous preservatives and are shown separately for the first time. This leaves 331,012 lb. of preservatives in the miscellaneous classification. Restoring them to their original classification for purposes of comparison, 1,650,783 lb. of miscellaneous salts were consumed by the industry in 1937, a decrease of 154,193 lb., or 3 per cent, compared with 1936. Miscellaneous liquid preservatives increased from 4,485 gal. in 1936, to 9,936 gal. in 1937.

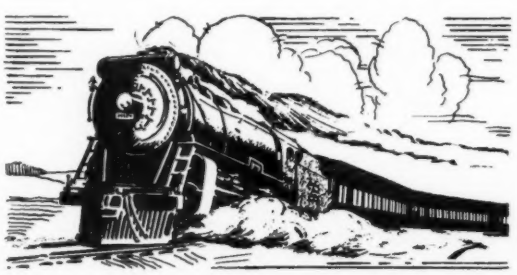
Wood Preservation, 1909-1937
Together with Consumption of Creosote and Zinc Chloride

Year	Total material treated, cu. ft.	Number of crossties treated	Creosote used, gal.	Zinc chloride used, lb.*
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,088	40,260,416	108,373,359	26,466,803
1914	159,582,639	43,846,987	88,764,050	27,212,259
1915	140,858,963	37,085,585	84,065,005	33,269,604
1916	150,522,982	37,469,368	96,079,844	26,746,577
1917	137,338,586	33,459,470	83,121,556	26,444,689
1918	122,612,890	30,609,209	56,834,248	31,101,111
1919	146,060,994	37,567,247	67,968,839	43,483,134
1920	173,309,505	44,987,532	70,606,419	49,717,929
1921	201,643,228	55,383,515	77,574,032	51,375,360
1922	166,620,347	41,316,474	87,736,071	29,868,639
1923	224,375,468	53,610,175	128,988,237	28,830,817
1924	268,583,235	62,632,710	158,519,810	33,208,675
1925	274,474,539	62,563,911	169,723,077	26,378,658
1926	289,322,079	62,654,538	188,274,743	24,777,020
1927	345,685,804	74,231,840	221,167,895	22,162,718
1928	335,920,379	70,114,405	222,825,927	23,524,340
1929	362,009,047	71,023,103	226,374,227	19,848,813
1930	332,318,577	63,267,107	213,904,421	13,921,894
1931	233,334,302	48,611,164	155,437,247	10,323,443
1932	157,418,589	35,045,483	105,671,264	7,669,126
1933	125,955,828	22,696,565	85,180,709	4,991,792
1934	155,105,723	28,459,587	119,049,604	3,222,721
1935	179,438,970	34,503,147	124,747,743	4,080,887
1936	222,463,994	37,952,129	154,712,999	4,127,886
1937	265,794,186	44,803,239	183,574,581	4,833,935

*Includes chromated zinc chloride.

Treating Plants Increase

There was an increase of 7 in the treating plants in 1937, the number being 224, compared with 217 wood-preserving plants in 1936. Of these, 209 were in active operation, an increase of 9, and 15 were idle. Nine new plants were completed in 1937, of which 4 were placed in operation, 7 of these being pressure plants and 2 non-pressure (open tank). Four plants were abandoned, 3 pressure and 1 non-pressure. Of the total plants in existence, 172 were commercial plants which treat wood for sale or by contract; 23 were owned by the railways, this being one less than in 1936; and 29, a decrease of 1, were owned by public utilities, mining companies, etc., to supply their own needs for treated wood.



TRACTOR COST STUDIES Reveal Interesting Data

Crawler Tractors Equipped With Front-End Loaders Are Used Quite Extensively on the C. & O. in Ditching Service

Analysis of Crawler Units on Chesapeake & Ohio Emphasizes Effect of Use Factor on Unit Costs

TO DETERMINE the performance characteristics of crawler tractors equipped with front-end loaders in cut-widening and ditch-cleaning service, the Chesapeake & Ohio has made detailed time studies and cost analyses of such operations. As a result, this company has developed some interesting data concerning the performance of this type of equipment, which demonstrates, among other things, the extent to which the use factor influences the unit cost of handling material. Another outcome of this company's experience with the use of crawler tractors equipped with front-end loaders in ditching service has been the development of a method of operation involving the use of a number of drag scrapers with each tractor, which materially increases the amount of material that can be handled on each trip.

The C. & O. now has eight machines classified as crawler tractors, all of which are equipped with front-end loading buckets, two having capacities of ½ cu. yd. and six of ¾ cu. yd. With one exception, these machines have no auxiliary equipment and are used only in operations where the use of front-end loaders is indicated. One machine is also equipped with a bulldozer blade.

Although these tractors are used from time to time for miscellaneous operations, they are used principally for cleaning ditches, widening cuts, removing earth scaled from bluffs and side slopes and the attendant widening of fills. On the C. & O. it is recognized that, since the crawler tractor possesses the advantage of being an off-track piece of equipment, each machine, manned by the operator only, is capable of performing all the operations incident to picking up loose or lightly compacted earth and transporting it to the point of disposal, thus eliminating the use of dump cars, wagons, wheelbarrows, and considerable labor.

It is pointed out, however, that in most cases one or more laborers are needed with each machine to shovel the earth into piles so that it may be readily picked up by the bucket, to redress the ballast shoulders, to trim the slope and to level off the earth at the dumping ground. The number of laborers required is dependent on the nature of the work, the composition of the earth to be removed and the distance to the dump.

Time Studies

Some time ago, this company conducted time studies of two of its crawler tractors engaged in cut-widening service. The two machines were working near each other at a point where the earth is composed of sand and clay and did not contain any rocks, thus making the digging work relatively easy. About one-half of the material removed consisted of consolidated earth lying in the bottom

of the ditch, while the balance was composed of loose material which had been scaled off the cut slopes. One machine was hauling the dirt about 1,700 ft. and the other about 250 ft.

In these studies, measurement of the earth quantities removed was made on the basis of hand-level cross-sections taken at 25-ft. intervals. All operations were accurately timed and the amount of gasoline consumed was carefully determined. Four sets of time studies, each set covering from 20 to 30 complete trips, gave the following averages:

Operation	Time Required
Picking up load	11 Sec.
Dumping load	35 "
Running forward, empty (per 100 ft.)	18 "
Running backward, loaded (per 100 ft.)	32 "
Total	96 Sec.

It will be noted from these figures that the time consumed in operating backward was much greater than that required for the forward movement. This situation is explained by the fact that the tractors involved, which were of an earlier type, had but one speed in reverse and that quite slow. Present models of tractors, however, are capable of operating in reverse at speeds materially in excess of those that could be achieved by the machines used in the test.

In the time studies, the average yardage carried, based on 47 loads by one machine and 95 loads by the other, was 0.83 cu. yd. On this particular job, two machine operators and three laborers were used with the two machines. Under ordinary procedure, however, each machine can be worked with one operator and one laborer. On this basis, the cost of labor and supplies for one machine amounts to $1.39 per hr. In computing the annual charges, $500 per machine was allowed for repairs while depreciation (five years) and interest at six per cent were computed at $670, bringing the total annual charges per machine to $1,170. On the basis of these figures, the hourly proportion of the annual charges was as follows:

100 days use per year—$1.46 per hour
200 days use per year— 0.73 per hour
300 days use per year— 0.49 per hour

When the cost of labor and supplies is added to the foregoing figures the total cost of operation per hour for each machine becomes as follows:

100 days use per year—$2.85 per hour
200 days use per year— 2.12 per hour
300 days use per year— 1.88 per hour

It is pointed out that the cost per cubic yard for handling the material removed is dependent on the composition of the earth, the height of the slope, the distance to the dump, and the number of days per year the machine is used. Based upon work similar to that studied, figures were computed to show the cost per cubic yard of hauling material various distances. These figures, as they are affected by the number of days which the machine is used annually, are given in the following table:

Distance hauled	Number of Days Per Year Machine Used		
	100	200	300
	Cost per cubic yard		
100 ft.	$.081	$.068	$.060
200 "	.136	.103	.092
300 "	.184	.140	.124
400 "	.230	.175	.155
500 "	.278	.211	.187
600 "	.312	.246	.218
700 "	.369	.281	.249
800 "	.415	.315	.280
900 "	.460	.350	.310
1000 "	.509	.387	.343

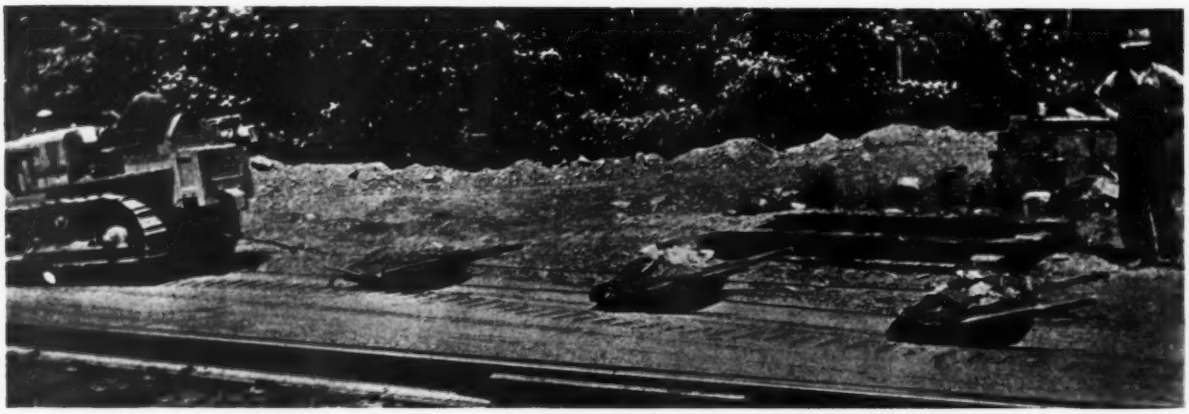
These figures, it is pointed out, illustrate the economy of using the machines a maximum number of days per year and also the necessity for controlling the distance which the material is hauled.

Use of Drag Scrapers

As a result of its experience with drag scrapers, this company now uses three such units of 7 cu. ft. capacity with each tractor, thus increasing the quantity of earth hauled per trip from 103 to 154 per cent. The usual method of operation is to enter the cut at one end with the scrapers attached to the rear of the tractor, load both the front-end bucket and the scrapers and proceed to the opposite end of the cut for dumping. The machine and scrapers are then turned about and the same procedure followed in the opposite direction, a dump being maintained at each end of the cut. For this operation, an organization of five men may be used economically, including the operator, a laborer at each dump, who unloads the scrapers and levels the dumped material, and two laborers in the cut who load the scrapers and trim the slope.

Where the length of the cut is excessive for economical operation in this manner, the procedure is revised by transferring the scrapers from the rear to the front of the machine in the cut after the bucket has been loaded. After the scrapers have then been loaded, the machine backs out of the cut. Upon reaching the dump, the scrapers are first unloaded, after which they are detached from the tractor and the bucket unloaded. The scrapers are then attached to the rear of the tractor and the machine again proceeds to the point of loading. Using this procedure, one laborer may be dispensed with, owing to the fact that only one dumping ground is used.

We are indebted for the information contained in this article to C. J. Geyer, engineer maintenance of way of the Chesapeake & Ohio.



Using Three Drag Scrapers Largely Increases the Material that Can Be Handled on Each Trip

Automobile Truck for Welding Frogs and Crossings

REPAIRING manganese-steel frogs and crossings by electric welding has been a settled practice on the Illinois Central for several years. Because of the size of this terminal, the intensive development of much of the terminal area with tracks and the number of trains, movement of an electric welding outfit to points where work was to be done presented a major problem, particularly with respect to the time involved in making the movement.

The Chicago terminal of this road extends from the Chicago river south to Richton, 29 miles, and from Roosevelt road west to Hawthorne, 10 miles, with branches to South Chicago and Blue Island, each about 4 miles long. The total trackage aggregates 603 miles, of which 253 miles are main tracks and 350 miles are yard tracks and sidings. In these tracks are 2,041 turnouts, 4 single and 48-double-slip switches, and 8 crossings at grade with other railways, each of which involves from 2 to 8 individual crossings. In addition, there are a considerable number of crossings north of Roosevelt road, for six suburban tracks cross from the east side of the right of way to the west side to reach the downtown suburban stations, while two freight tracks from the western line cross to the east side to reach the receiving yard at Jackson street.

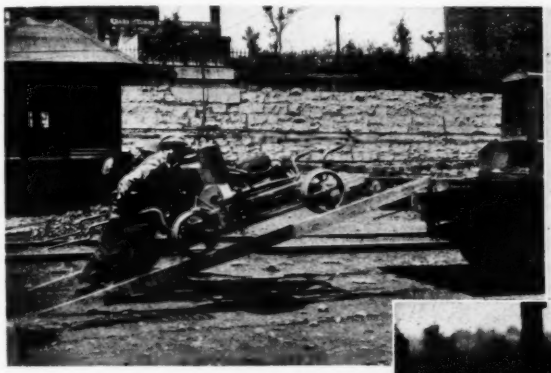
In addition to the extent of the terminal and the large amount of trackage, the difficulty of moving a welding outfit mounted on the rails was aggravated by the fact that 759 trains are scheduled every 24 hours, or slightly oftener than one every 2 minutes. Obviously, the necessity for keeping clear of trains presented a serious handicap to the continuous operation of the welding outfit. Furthermore, the intensive development of some of the areas with tracks made it impracticable to find a suitable place for setting off rail-mounted equipment adjacent to the work.

This problem was solved by mounting a welding generator on a 1½-ton automobile truck. The body is of sufficient size to accommodate in addition, a combination surface and cross grinder with rail mounting, the necessary cable and other appliances and supplies, together with several heavy planks which are placed against the rails when crossing tracks. This outfit can be moved from one job to another, using the city streets, with little loss of time compared with similar rail-bound equipment. In fact, the use of this truck has increased the average productive time about 40 per cent, compared with a railbound outfit.

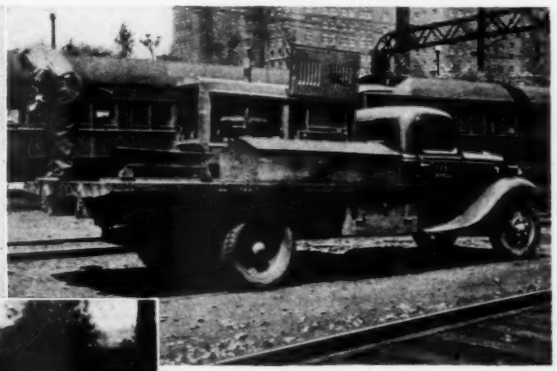
Despite the fact that the tracks north of Roosevelt road are depressed about 20 ft. below the level of Grant park, that for much of the remaining distance to Richton and to Hawthorne the tracks are elevated and that there are as many as 12 parallel main tracks, no difficulty has been experienced in obtaining access to the work with no more than 300 ft. of cable.

Where necessary, the truck is driven across tracks without difficulty. As soon as it is parked, skids are set up at the tail board and the grinder is lowered to the ground, and set on the track to grind out defective or flowed metal. While the grinding is under way the cable is run to the point of welding so that this operation can be started as soon as the grinding is finished.

Results have been so uniformly successful since this outfit was placed in operation in 1933 that two others have since been purchased for use elsewhere on the system. In addition, a similar outfit is in use on the New Orleans terminal of this road, although this one is mounted on a trailer which is towed from point to point by an automobile truck. A fifth outfit is mounted on a crawler-type tractor.

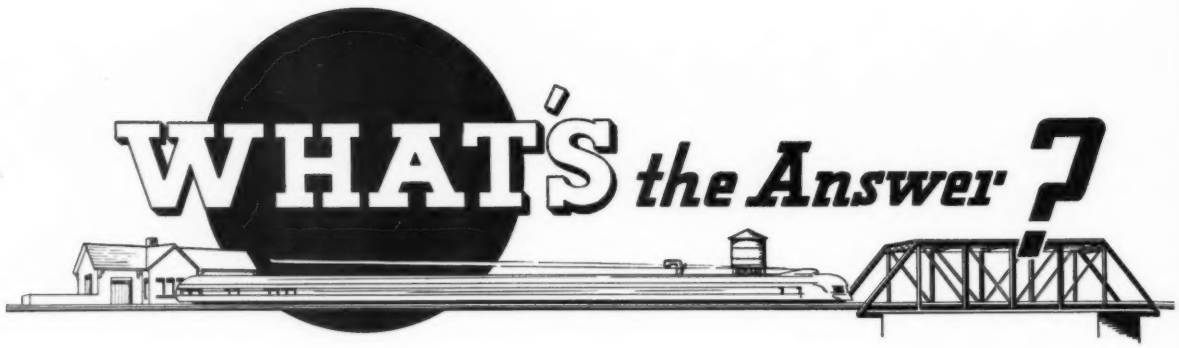


Skids Facilitate the Loading and Unloading of the Grinder



The Truck-Mounted Generator Used in the Chicago Area

The Welding Operation Can Be Carried Out 300 Ft. from the Truck



Collisions Between Motor Cars

What precautions should be observed to eliminate collisions between motor cars? Between motor cars and trains?

Keep a Sharp Lookout

By E. L. Henry
Assistant to General Manager, Chicago & North Western, Chicago

Collisions between motor cars moving in the same direction can be avoided by spacing them far enough apart, never less than 500 ft., and farther when rails are wet or frosty, when visibility is limited and when heavy loads are being handled, to insure sufficient braking distance to bring the rear car to a stop short of the preceding car in case it stops suddenly. Under any of these conditions a sharp lookout must be maintained and the car speed so controlled that the operator will know at all times that he has sufficient distance in which to make a stop. The necessity for maintaining a sharp lookout in the direction of the movement is emphasized by the fact that collisions between motor cars have resulted from men riding with their backs to the wind, or with their attention focused on pole lines or other facilities of which they are making a running inspection.

When moving around curves, speed should be controlled so that a stop can be made within half of the distance of vision. This is to insure that a collision will not occur if another car should reach the curve from the opposite direction at the same time, or if a preceding car should come to a sudden stop on the curve.

Collisions between motor cars and trains are likely to occur with greater frequency and more disastrous results than collisions between motor cars, owing to the greater speeds of both passenger and freight trains. For this reason, greater vigilance is required to insure that the cars will be removed from the track well in advance of the passage of trains.

To prevent accidents of this type it is of first importance that motor car operators obtain a line-up of trains from the dispatcher whenever possible, and as frequently as circumstances will permit while the car is being run. This line-up should be taken in writing and read to other members of the gang before proceeding, so that all will be familiar with it. It should also be understood that such a line-up does not relieve the operator of any of his personal responsibility for the safe movement of his car. He should not overlook the fact that trains may be expected to run either in advance of or behind schedule, and that extra trains may be operated in either direction at any time. This latter is particularly true during inclement weather when snow plows or other work trains may be required, sometimes quite unexpectedly and after a line-up has been given. At such times visibility is likely to be poor and enginemen unable to maintain as good a lookout as in fair weather.

When loads are being handled that cannot be removed readily from the track, or when movements are being made in specially dangerous districts, motor-car operators should be protected either by the dispatcher or by flagging by members of the crew of the motor car. Motor-car operators should also realize the importance of observing the indications of block signals and signals carried by passing trains, so that they may know whether other sections of these trains are to follow. A lookout in the direction of the movement and to the rear should be maintained by members of the crew specially designated for this

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in September

1. Do rail joints freeze more easily on some sections of rail than on others? If so, why? On what sections? Does the design of the joint make any difference?

2. What special precautions should be employed to prevent leaks in a built-up asphalt roof? To repair leaks?

3. Who should place slow orders? Under what circumstances should they be placed? Who should be notified? Who should lift them? Why?

4. What causes hair cracks in concrete surfaces? How can they be prevented? How do they affect the structure?

5. What methods can division officers employ to insure the fullest use of power machines?

6. Under what conditions can compressed air be used to restore the flow in a well? How can this be done?

7. Is there a limit to the lift that can be made and still do a good job of tamping with power tamping tools? If so, why? What are the limitations? If not, how should the work of making a high lift be handled?

8. What are the relative advantages and disadvantages of ready-mixed paints for bridges and the exterior of buildings? For the interior of buildings?

service, as further protection against trains in either direction.

In conclusion, motor-car movements should never be made if, after all available precautions have been taken, any doubt still remains that such movements can be fully safeguarded from every standpoint.

Obey Safety Rules

By E. G. Evans
Superintendent of Safety, Louisville & Nashville, Louisville, Ky.

Collisions between motor cars and between cars and trains can be eliminated through strict observance of the rules governing the use of motor cars. Let us start at the beginning and inquire about the motor car itself. Is it in good condition? Are the brakes in good shape? Is the engine balky? Is the running gear loose or worn? Weekly cleaning and tightening, insisted upon by supervisory officers and checked by inspections, will insure that accidents resulting from mechanical defects, a goodly number of the total, will disappear.

Next, let us look to the loading of the car and to the placement of the men. Materials, tools and men must be so placed that there will be no danger of fouling the brakes, or of men or materials falling from the car, causing delay or derailment. Full specified flagging equipment must be placed on the car, properly protected and instantly accessible.

The duties of the men who accompany the car must be clearly defined, especially those of the men of proven capability. The car must be in charge of an operator who has been qualified by examination, and other men must be regularly assigned to front and rear lookout positions, with instructions to keep a constant watch for approaching trains, motor cars and all other hazards. Before starting out, a line-up of trains must be obtained from the dispatcher and the operator must make certain that it has been given plainly and clearly, and that he understands it correctly.

Motor cars must be operated at safe speeds, based on the known braking power, but in no instance in excess of 20 miles an hour. When the view is limited, or obscured by poor visibility, the speed must be reduced to the point where a stop can be made within one-half the range of vision. It should be determined and made a matter of record just what places on a division are or may be dangerous under any conditions, and instructions should then be issued as to the proper procedure to prevent the motor car being struck. This should include flagging or the sending of a man ahead to a point where a clear view of the track or the governing automatic signals can be obtained. The protection to be given the car while conditions are thus being determined should also be decided and instructions issued accordingly. A distance ample for safety must always be kept back of a preceding flagman; while a flagman, cautionary torpedoes or a stop signal must be used to protect cars from the rear when necessary.

Motor cars must not be run closer than 500 ft. apart and must not follow a moving train or approach a standing train closer than 500 ft., except for the purpose of removing the car from the track upon which the train is standing. When two cars are moving in the same direction, the one in advance must not be stopped until the following car has been signaled. On multiple tracks, cars must be run in the direction of traffic. They must be clear of the main track 10 min. before passenger trains are due, except in block-signal territory, where signal indications may be followed. When not in use, they must be off the track.

When passing through tunnels one white light must be displayed at the front and one red light to the rear. When emergency demands that the car be used after dark, during stormy, foggy weather, or beyond the limits regularly assigned to those in charge of it, written permission for its operation must be obtained from the dispatcher, all precautions that have been mentioned must be observed, and the speed must not exceed 15 miles an hour. When enroute to the scene of an accident, every precaution must be taken to ascertain its location and special care exercised in approaching it. Operators must not fail to observe classification signals displayed on engines of passing trains to know whether another section of any train is following. Motor-car set-offs must be constructed at designated locations.

This discussion has been put in the form of a listing of the mandatory rules governing the operation of motor cars, so far as they pertain to the possibility of collisions, for it is only by observing these rules strictly that motor-car collisions will be eliminated.

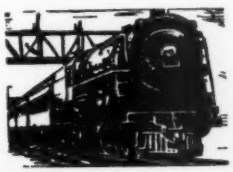
How Often to Paint Screens

How often should screens be painted? When should this be done? What is the best type of brush to use?

Conditioned on Factors

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Any answer to this question must be conditioned on several factors, including the location and climate in which the screens are to be used. In general, the protection of screen wire against corrosion is no different from that of protecting other metal products. On the other hand, there are conditions where special measures to combat corrosion must be taken, such as along the sea coast where the salt-laden air rusts ordinary screen wire quickly unless protection is given. Here and in industrial districts, where fumes from burning coal also attack the wire, it is well to use brass or copper wire for screens.



Ordinarily, however, and I assume this is the intention of the question, a good grade of paint applied before corrosion gets a start, should afford ample protection. It has been my observation that it is advisable to paint the wire at the same time that the frames are painted in the spring, when window and door screens are being applied for summer service.

If what is generally termed black wire is used, the painting must be done frequently, for this wire is particularly susceptible to corrosion and must be painted every alternate year, and in some cases every year. On the Missouri Pacific we are now using a 16-mesh, dull-finish, galvanized-wire screen which does not require painting until it has been in service for several years.

With almost any kind of a brush, many of the mesh openings will be filled after the second or third painting unless special care is used in making the application. For this reason, when brushes are used it is important to have the paint as thin as practicable and still get good coverage. We have

found that it is good practice to paint screens by means of paint sprays because we get a much more satisfactory job by this method.

To protect the screens when not in use, they should be removed carefully in the fall and housed in a dry place during the winter. They should be laid straight without being called on to carry any weight that would tend to warp the frames or bulge the wire. Properly cared for, both door and window screens last many years, provided galvanized wire is used.

Use Stiff Brush

By General Inspector of Buildings

Ordinary wire screens should be painted annually if they are on buildings exposed to locomotive gases or are exposed to other conditions conducive to corrosion. These include yard offices, offices at engine terminals, buildings along the sea coast, etc. On the other hand, if a good grade of paint is used and care has been exercised in applying it, screens on company dwellings and other buildings where the exposure is comparable may be painted on alternate years with safety. Not infrequently, the paint applied on this type of wire, commonly known as black wire, by the manufacturer, is of inferior quality, which does not last through the first season. For this reason, although protection from moisture is always important, special care should be exercised to store the screens in a dry place during the first winter after they have been placed in service.

Galvanized wire is much better for screens and has the advantage of sufficient additional life to warrant its high cost. A screen made of galvanized wire, if the galvanized coating is of satisfactory quality, will not require painting for three or four years, unless the exposure is severe, which will in part offset any additional cost of the material. In fact, it is difficult to paint when new, as all galvanized surfaces are, and it is usually necessary to give it an exposure of several months before there is any assurance that the paint will adhere to it.

In general, the proper time to paint screens is in the spring just before they are put up for the summer. This is usually the time when repairs are made, and these should be completed before the paint is applied. If the old wire has been replaced with black wire, it may be wise to apply a thin coat of paint to the wire, since this will afford more protection than the paint applied by the manufacturer.

For applying the paint, a reasonably stiff flat bristle brush, two or three inches wide, with a bevel point will give best results. The paint should be somewhat thin and should be well worked in. Otherwise, the mesh will become filled with paint, and where this occurs the wire almost invariably cracks and the protective value of the screen is lost and it must be renewed in a relatively short time.

High-Early-Strength Cement

Under what conditions is the use of high-early-strength cement of advantage? Of disadvantage? Are any precautions necessary?

Two Types

By M. Hirschthal
Concrete Engineer, Delaware, Lackawanna & Western, Hoboken, N.J.

A little more than 15 years ago the advent of high-early-strength cement, one that produced the usual 28-day strength in 24 hrs., filled a long-felt want in the maintenance of traffic, or the minimum disturbance of traffic, during reinforced-concrete construction. A two-track concrete deck on a steel bridge could be installed with only two days of single-track operation, compared with, say, two months under former conditions. This advantage of minimum disturbance to traffic remains today, but the use of high-early-strength cements has been expanded into more general use at present because of the possible construction economies it affords.

Where it is used it is possible to release forms in from one-third to one-seventh of the time where normal cements are used; the curing time is likewise reduced, particularly in winter. For these reasons the overall time of construction is reduced with corresponding reductions in charges for plant, interest, and insurance, while the plant can be released sooner for use elsewhere.

There are two types of high-early-strength cement; one a true portland cement and the other an aluminate cement, not of the portland type. The latter was the first to appear on the market and held possession of the field for many years until manufacturers of portland cement were able to produce the portland type of high-early-strength cements which are now in vogue.

The disadvantages of high-early-strength cements, if they may be so termed, are higher prices than for normal cements and rapid hardening (not setting) that may entail increased shrinkage stresses. Neither of these factors is at all serious, the former being merely a matter of calculation in relative economy.

Among the precautions to be observed are not to place such reliance in these superior cements as to disregard the requirements for making concrete with normal cements. For instance, a high water-cement ratio will increase the time when a desired 28-day strength is attained to from 3 to 7 days, instead of in 24 hr. Failure properly to cure the concrete will cause early appearance of shrinkage cracks. A precaution in the use of aluminate (bauxite) cement is that curing water, or water for any other purpose, must not be applied too soon after the cement has set. A precaution necessary with all high-early-strength cements is to avoid shipments in cloth sacks. Air-tight containers should be used, for they lose some of their high-early-strength qualities if exposed to the air before use. With these simple precautions these cements will perform their intended functions. They are finding ever-increasing popularity in reinforced concrete work.

Check the Type

By C. C. Westfall
Engineer of Bridges, Illinois Central, Chicago

It has been our experience in the use of several brands of high-early-strength cement that some types require special attention during the curing stages, while others are no different in this respect from normal portland cement. In choosing the type to be used, therefore, curing must be considered and the decision as to the brand should be based on whether the necessary precautionary measures can be taken on the work at hand. Our experience with these cements has been very satisfactory as we have used special care in curing and have had no failures.

One of the chief advantages of these cements is that structures may be put into service more quickly than with the slower-setting cements. We have used high-early-strength cement for

floor slabs on several bridges where individual tracks could be kept out of service for a very limited time; and for the upper sections of large river piers that could be only partly completed during the first stage of the work because of interference by old deck trusses, thus advancing the erection of the new steel. It also permitted us to complete the foundations and heavier sections of the piers before we placed the spans on falsework.

Considerable use has also been made of high-early-strength cement in pedestal blocks for steel spans and in bridge seats to replace failed stone or concrete bridge seats. It is also a general practice to use it for constructing test piles to determine the proper length for concrete foundation piling.

We first used this cement in 1925, and the condition of the concrete in every structure in which it has been used appears to be no different from that in structures in which normal cement was used. In every case, the advantage of obtaining proper working strength in a short time has been the basis of the decision to use it, and the results have always more than offset the difference in cost.

I see no disadvantages in the use of this type of cement, except for those cements that require special treatment in curing, and where the structure is of such a type or so located that this special treatment cannot be given. I recall one instance that came under my observation where high-early-strength cement was used at some premium in cost, but was not properly cured. In addition, the time that elapsed before the structure was put into service would have permitted the use of ordinary portland cement. There was, therefore, not only a waste of money, represented by the additional cost of the cement, but owing to improper care, the concrete was unsatisfactory and a poor job was obtained.

About the only precautions necessary are those of curing, as already mentioned, and care that the cement be well protected and used promptly, as quick hardening cements are not adapted for long storage.

Distributing Ties in Yard

What is the best method of distributing ties for renewals in yard tracks? How far in advance of the work should they be unloaded? Why?

For Each Day Only

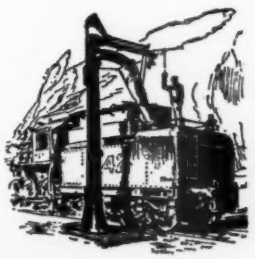
By W. E. Folks

Track Supervisor, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

Our practice when distributing ties for renewals in yard tracks is to unload only the number of ties that will be applied during the day for which they are unloaded. It is always necessary that the foreman make arrangements with the yardmaster to obtain access to the track he intends to work on, to insure that all yard employes will be given information that the track will be out of service during the working hours of the gang. This should be done on the day before he wants the track, to give time to get the information out as well as to enable him to make his own arrangements.

He will then be able to load one or more push cars with the number of ties he will be able to apply that day. They should be unloaded in advance of the work and the push cars held for the loading of the old ties, which must be picked up and removed from the yard by the time the day's work is completed. This will permit the track to be restored to service temporarily during the night if the work cannot be completed in one day, or permanently if the work has been completed, as soon as the gang is through for the day.

This practice has proved satisfactory, first, from the safety standpoint, since neither the new nor the old material is allowed to clutter the yard, every day's work being completed and the track cleared at the close of the day. Second, the yard is given the fullest use of the track consistent with making repairs and, if the gang is called unexpectedly to other work on the following day, there is no interference with the yard operation. And last, it tends to put method and system into yard work, which under the best of conditions is difficult to maintain, because so many tasks arise without previous warning in a busy yard.



Uses Motor Car

By Thor Monrad

Track Supervisor, Northern Pacific, Columbus, Mont.

Ties can best be distributed in a yard by using a motor car and a push car. The reason for this is that train service can rarely be obtained readily for this purpose, while it is too expensive to rely on as a general practice. Furthermore, it is not altogether safe to handle ties from a train in a yard, because clearance with adjacent tracks is limited, and the ties can easily foul movements which may be made on these tracks. Again, for a train to be of any advantage it becomes necessary to distribute the ties too far in advance of the renewals, and this would certainly create unsafe conditions for switchmen and car repairers who find it necessary to work at the points where the ties have been distributed, particularly at night.

Under conditions that exist in every yard, ties cannot be unloaded to correspond with those that are to be removed or exactly at the point of use if they are distributed from a train. For this reason, they must be picked up and placed properly by hand, a complete waste of productive time. Even in a yard where the foreman is a good manager who takes advantage of all of his opportunities to eliminate lost motion, there is enough unproductive time without adding to it deliberately.

Ties should never be distributed in greater number than can be put in during the day on which they are unloaded. Likewise all of the old ties should be picked up before the work for the day is finished, to insure that no obstruction will be left for men to stumble over. By loading the ties on one or two trailers they can be hauled quickly to the track where the renewals are to take place and unloaded exactly at the point of use. The trailers and motor car can then be retained for loading the old ties and hauling them away at the end of the day. I prefer a motor car to haul the ties in and out as pushing the loaded cars by hand is slow work and the delays are usually many times those that will be encountered in a busy yard, provided a quick movement can be made by a motor car.

Obviously, if the gang is a large one and the motor car is needed elsewhere during the day to facilitate work or the handling of material by

other units, it can be assigned to this other service until it is needed to take the cars loaded with old ties out in the evening. Handled in this way safety is promoted for the yard gang and for other employees who must pass alongside the track in which the renewals are being made, for it is generally a good idea not to distribute all of the new ties at one time, and to keep the old ties picked up from time to time as the renewals progress.

Minimum Head and Motors

To what extent should the minimum head be given consideration in selecting motors for driving centrifugal pumps? Why?

Requires Careful Study

By J. H. Davidson
Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

As the first step in selecting a centrifugal pump for any installation, one should secure accurate data concerning the quantity of water required per minute; the total head to be pumped against, including the discharge, suction, pipe-friction and velocity heads; and the type of power available for driving the motor. Any of these factors that may be subject to wide variations, such as the maximum and minimum head to be encountered, should be given special consideration, so that the most efficient pump and motor that will safely handle the extreme conditions may be selected.

No pump and motor should be selected without careful study of the pump characteristics, which are graphically illustrated by three curves called respectively the head of pump, the brake horse-power and the efficiency curve. These characteristic curves are determined from an actual test of the pump, and will be furnished by the manufacturer on request. They are usually incorporated in any guarantee given by the manufacturer.

If the speed of a centrifugal pump remains constant, while the head against which it pumps is decreased, a greater quantity of water will be delivered and the power consumption is increased. Therefore, if the pump has not been designed to avoid this, the motor may be severely overloaded and damaged. This can be avoided by the use of variable-speed motors, so that the speed can be decreased whenever the head decreases, permitting the proper quantity of water to be delivered.

Pumps are designed which have what is called the non-overload type of power characteristic, so that it is practically impossible to overload the power unit by a decrease in the head against which it operates. It will be seen, therefore, that proper consideration of the minimum head to be encountered in any centrifugal-pump installation will result in the selection of a unit that will operate at the greatest possible efficiency under normal or usual conditions and, at the same time, be capable of operating under extreme conditions without danger of injury to the motor.

Do Not Overload

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Minimum head is a matter of extreme importance when determining the size of the motor required for driving a centrifugal pump. Electric-power contracts frequently incorporate a certain fixed or so-called stand-by charge to cover connected load, thus making it desirable, aside from other considerations, to select the smallest motor that will fulfill requirements. At the same time, one must keep in mind that the horse power required is the product of gallons per minute and head against which the pump works.

Pump curves show drooping characteristics after passing the point of maximum efficiency, but the greater volume of water delivered as the head drops will, in most cases, increase directly the power required, and should be taken into account. It is not only necessary that the motor be ample for economy under average working conditions, but that it shall also be of sufficient capacity to cover the increased load that may result from pumping an excessive volume of water when the head, resulting from an empty reservoir, a discharge-line failure or other cause, has unexpectedly dropped to the minimum.

Motors may stand an overload of 10 to 15 per cent for an hour or two without damage, but it is desirable to select a motor of such capacity that this overloading will not occur. As a further precaution, the installation should be protected by overload relay and low-voltage release.

Packing Ice in Icehouses

What advantages, if any, are there in packing ice in icehouses in sawdust? If none, why? What alternatives are practicable?

Provides Cheap Insulation

By A. L. Sparks
Architect, Missouri-Kansas-Texas, St. Louis, Mo.

In northern sections where it is possible to harvest natural ice easily and cheaply and store it for use throughout the year, cheap insulation in large quantities becomes necessary. In such districts sawdust is usually available at low cost, and from its performance record over many years its insulating value is well known. If timber had not abounded in the colder regions, other types of insulation might have been developed and no doubt some of them might have been used as widely as sawdust.

Heating, ventilating and refrigerating engineers have given recognition to the insulating value of sawdust in calculating heat transmission through walls. I have before me an old copy of the American Society of Heating and Ventilating Engineers' Guide, in which a sawdust-filled outside wooden wall is rated as being about 43 per cent more effective from the insulating point of view than the same wall without the sawdust filling. It is my own observation that sawdust has three distinct advantages for packing ice in icehouses, namely:

1. Low cost and availability in large quantities.
2. It shrinks or slumps only slightly until it begins to decay.
3. It is not easily saturated and retains its insulating advantages even when the ice underneath is melting.

Wet surfaces transmit heat rapidly when exposed to the air, but as the outside surface of the sawdust remains dry it retards evaporation and does not transfer heat rapidly. Doubtless there are other types of insulation

that will preserve ice as effectively as sawdust, such as pulverized cork, magnesia, mineral wool, excelsior, cane fiber and other similar products. It is unlikely, however, that any of these can be obtained at prices sufficiently low to compete with sawdust, or to make stored ice more economical than artificial ice which has the advantage of being manufactured at or close to the point of consumption, thus saving in both shrinkage and the cost of transportation.

Cost Is High

By Engineer of Buildings

About the only advantages that can be claimed for sawdust as a material for packing ice are its relatively low cost, its availability in almost any quantity and the ease with which it can be handled. An analysis of its use will demonstrate, however, that while it is a low-priced material the cost of its use is surprisingly high. For this reason, its suitability is limited to the storage of natural ice which can be put up in large volume at very low cost, but even here the ultimate cost of its use may be quite high.

Assume a non-insulated ice house, such as is found in almost every natural-ice region. The ice must have a layer of sawdust, preferably 12 in. thick, around all sides and 18 in. thick over the top. The labor of placing this sawdust is substantially the same as that of placing an equal amount of ice. However, the cost of removing it from the house and storing it as the ice is used is relatively much more expensive. Besides, there will be considerably shrinkage from melting of the ice when packed in this manner, and drains must be provided, into which considerable quantities of the sawdust invariably find their way. The cost of keeping the drains open must, therefore, be considered as a part of the cost of using the sawdust. For these reasons, it is far better to use an insulated ice house.

To demonstrate, assume an ice house 100 ft. by 60 ft. with side walls 26 ft. high. The net capacity will be 4,000 tons, and the space occupied by the sawdust around the sides will be equivalent to 213 tons of ice, but this can be ignored, for good practice requires that the ice in a refrigerator type (insulated) house be kept at least 12 in. from the outside walls. Ice packed in sawdust generally shrinks about 20 per cent, which in this case will amount to 757 tons, leaving 3,030 tons available for use. In properly insulated ice storage, the loss from shrinkage should not be greater than 10 per cent, so that 3,409 tons will be available. This makes a difference of 379 tons, which at $7.50 a ton will amount to $2,842.

It should be kept in mind that this is a continuing annual expense; capitalizing it at 5 per cent, one will have approximately $60,000 as the sum that can be spent to construct the most modern type of insulated house with up-to-date equipment for handling the stored ice. The cost of maintaining such a building over a term of years will also be less than that of the sawdust type, since the wet sawdust tends to accelerate decay of the studding, lining and even the siding, while with the refrigerator type, if the floor is water proofed and the lumber is treated, this will be a negligible item.

When to Pick Up Scrap

Is it advisable to assign certain days of the week or month for section gangs to pick up scrap and do other forms of policing? What are the benefits?

System Furthers Economy

By E. P. Safford
Supervisor of Track, New York Central, Silver Creek, N.Y.

System always furthers economy. This is as true in recovering scrap and in other minor policing as in any other class of work. For this reason, I believe that it is good practice to set aside a day a month for picking up scrap. Small amounts of scrap spikes and bolts can be taken to the tool house every night or placed in small piles along the sod line for the monthly pick-up train to handle later.

On the cleaning-up day small odd jobs that are always arising can be cared for to complete the day, for less than a day will be consumed in cleaning up any section, and this will cause fewer interruptions to the larger and more regular work of the gang. With better freight-car construction now than in former years, heavier car scrap, such as draw bars, brake beams, etc., are not so common along the right-of-way as they used to be, and this aids in maintaining the road in a presentable condition.

Does Not Favor

By J. Edmond
Roadmaster, Atchison, Topeka & Santa Fe, Clovis, N.M.

It is not advisable to assign certain days of the week or month for picking up scrap and otherwise policing the sections. This should be left to the judgment of the foreman, as conditions often arise which make it necessary to do these things out of the order of any regular schedule that can be prepared, including the possibility that they can be done at less cost in connection with other work.

If regular days are assigned, there will be many times when this schedule will interfere with other important work, and in some instances, with which every maintenance officer has had experience, this will afford some foremen an excuse for not having their scrap picked up or their right-of-way clean. The collection of scrap can and should be made on days when the gang cannot work to advantage on the track. If the foremen are made to understand clearly that scrap must be kept picked up, and are then allowed to make their own arrangements, it will be one means of educating them in management, which cannot fail to be of benefit both to themselves and to their supervisory officers, for too detailed supervision is almost as bad as too little.

Pick Up Daily

By W. H. Haggerty
Track Supervisor, New York, New Haven & Hartford, Harlem River, N.Y.

Small scrap left on the right of way is always a potential hazard, for mischievous children or adults with malicious intent may place pieces on the rail with serious consequences. The temptation to do this is materially lessened if the track and right of way are kept clean at all times. Items of small material used by section men or small extra gangs are generally distributed from push cars, motor cars or highway trucks. Only what is needed for the day's work should be distributed at one time, and the scrap or usable material that is released should be loaded and returned to headquarters at the end of the day.

This does not apply to rails, frogs, switches, etc., which cannot be handled by a small gang. Such material should be placed in the clear in neat piles for loading when a crane or a larger gang is available. It is also good

practice to pick up currently all material released when laying rail. This not only keeps the roadbed and right of way clean, but it reduces the non-productive work train time and reduces interference with traffic to the minimum.

Other policing can be cared for by the track walkers, or motor patrol. While their duties are next in importance to those of the foremen, they can give time to this detail without interfering with proper inspection of the roadbed and right of way. I consider it just as economical to pick up scrap daily as to set aside certain days to do it, while it is a safer practice and keeps the right-of-way neat and clean at all times.

Is of Advantage

By J. Morgan
Retired Supervisor, Central of Georgia, Leeds, Ala.

I heartily favor assigning certain days for the foreman and his gang to pass over the section to pick up scrap, to give the track and right-of-way a close inspection, to correct minor irregularities of the track, to do other forms of policing and attend to other details that need attention. It is seldom that general rules as to the date or procedure are satisfactory, since local conditions vary so widely, for which reason the matter should be left to supervisory officers to work out.

As an example, I had two sections on my district that were in manufacturing districts with busy industrial tracks and almost constant switching; and two other sections among the hills where the grades and curvature were heavy. On the former we picked up scrap once a month, but because of the physical characteristics of the latter two we considered that a policing and inspection trip once a week was warranted.

It should be understood that any schedule that may be in effect does not relieve the foreman from the requirement that he pick up all released material at the end of his day's work, and other items that may be observed in passing to and from work. But by setting aside a day, much closer observation will generally be maintained, while many small defects in the track can be taken care of without disarranging plans for other days. Again, by keeping the small items picked up, the temptation that comes to children to place things on the rail to see the locomotive run over them will be eliminated, a practice that often creates a real hazard.

Applying Anti-Creepers

At what point in the rail-laying operation should the anti-creepers be applied? Why?

Apply at Once

By B. R. Kulp
Engineer of Maintenance, Chicago & North Western, Chicago

Anti-creepers should be applied immediately after the rail has been gaged, lined and spiked into final position and before the expansion shims have been removed, or the track opened to traffic. The purpose of anti-creepers is to hold the rail in a fixed position after it has been laid to proper line and gage and with correct allowance for expansion, and to maintain this position after the track has been restored to service. It would be a useless refinement and a waste of effort to provide this expansion allowance at the rail joints, only to lose it by removing the expansion shims before the anchors have been applied. Although subsequent tie spacing in connection with surfacing may make it necessary to reset some of the anti-creepers, this does not alter the need for placing them during the rail-laying operation to hold the rail in its original position, thus retaining the correct expansion.

Before Traffic Is Resumed

By T. E. McMannis
Track Supervisor, Central of New Jersey, Somerville, N.J.

It is most important to have the anti-creepers applied before the track is opened for traffic. It makes no practical difference at what stage of the rail-laying operation this is done, provided proper allowance has been made for expansion. The usual order, however, is to make the application as soon as the gaging and spiking have been completed.

When rails of normal length are laid, the expansion gap should be sufficient to prevent crowding of the rails. Movement of the rail-laying equipment should not be sufficient to cause creeping of the rails, since it is moved slowly, for which reason I believe that application of the anti-creepers at any time prior to the resumption of traffic will be satisfactory in most cases.

Before Removing Shims

By L. A. Rape
Section Foreman, Baltimore & Ohio, Claysville, Pa.

Anti-creepers should always be applied prior to the removal of the expansion shims, between the gaging and the spiking. This is particularly important when laying rail under traffic, since it will insure that no train passes over the newly laid rail until the anti-creepers are in place and functioning. If the anti-creepers are being placed on the side of the ties toward the direction of the progress of the work, they will prevent the movement of the rail through accidental bumping as the rails are being laid in the track.

Keep Closely Behind Front

By District Engineer

The time for applying anti-creepers becomes of major importance when rail temperatures are changing, if the correct expansion allowance is to be maintained in the new rail. Special attention should, therefore, be directed to having them applied as quickly as practicable after the rail is in place, a matter that is sometimes neglected in the effort to progress rapidly with the laying of the rail.

Obviously, the expansion shims should not be removed until the anchors are functioning, but in the mornings of warm, clear days the temperature of the rail increases rapidly until about noon, for which reason the shims should be removed as soon as possible. However, it is not good practice to place the anti-creepers until after the track has been accurately gaged.

This indicates clearly the importance of keeping the bolting and gaging units as closely behind the actual setting of the rail as proper spacing of these units will allow. I have always required rail-gang foremen to give particular attention to this feature of their work, for the expansion allowance can lack uniformity unless it is given the attention its importance demands. It is scarcely necessary to say that the shims should be removed as soon as the anchors are in place, to insure that they are not overlooked.

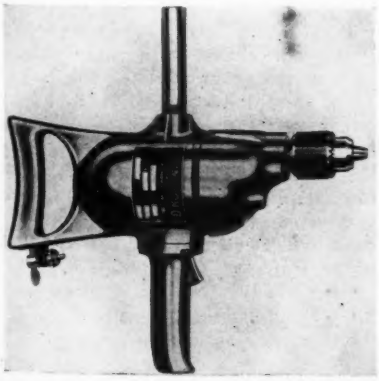
PRODUCTS of Manufacturers

Welding Electrodes in Sealed Cans

THE Harnischfeger Corporation, Milwaukee, Wis., is now marketing its Smootharc welding electrodes in vacuum-sealed cans, with the size and type of electrodes plainly marked on the sides and bottom. The electrodes are placed in the new containers immediately upon being taken from the drying ovens, and the tops of the cans are then sealed. The containers can be opened quickly and easily with a key which is attached to one end. It is claimed that the electrodes furnished in these containers can be kept indefinitely without deterioration owing to absorption of moisture by their sodium silicate binder, and that, as a result, the problems of surplus stock, storage, shipping and handling of the electrodes are greatly simplified, with resulting economies.

Syntron Drills

THE Syntron Company, Homer City, Pa., has introduced a complete new line of electric drills, an example of which is the ½-in. model illustrated in the accompanying photograph. This unit, which is known as Model No. 12-S, is of "streamlined" design, all corners being given a rounded contour so that they will not catch in the operator's clothing.



The New Syntron Model No. 12-S Electric Drill Has Several New Features

This drill is powered by a Universal motor which is enclosed in an aluminum housing. All reduction gears are of heat-treated chrome molybdenum steel and are mounted on ball bearings. The three-jaw geared Jacobs chuck with which the drill is equipped accommodates straight-shank drill bits up to ½ in. in diameter. Hand grips on the drill consist of cross-bar handles as well as a handle of the spade type, insuring a firm hold.

Celotex Will Market Light-Weight Aggregate

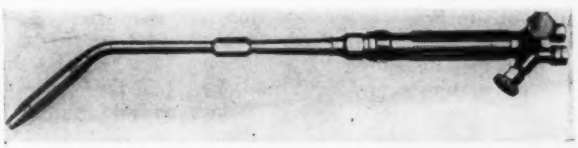
THE Celotex Corporation, Chicago, has acquired the right to manufacture and sell Pottsco light-weight concrete aggregate. This material is made under a patented process by water treatment from molten basic pig-iron slag. This process is said to produce a vitreous clinker of porous cellular structure, that possesses both thermal and acoustical insulating properties and that is twice as resistant to heat as ordinary aggregates, such as crushed stone or gravel.

It is claimed that in fire tests conducted at Columbia University, during which the furnace temperature was raised to 2,000 deg., F., the temperature of the metal core, which was protected with 2 in. of Pottsco concrete, rose to only 800 deg. after a 4½-hr. exposure, while in similar specimens coated with the same thickness of concrete composed of sand, gravel and crushed stone, the temperature of the encased metal rose to 1,000 deg. F., in a period of only 2¾ hr.

To prepare this material for use, the clinker is crushed and screened to suitable sizes and graded into coarse and fine aggregates. It is claimed that by careful control of proportioning and water content, crushing strengths of 2,000 to 5,000 lb. can be obtained. It is said that this material has been used widely in building construction for floors, roofs, load-bearing walls above ground and for the encasement of columns, and that it is suitable for bridge floors and for monolithic structures above ground. It is also said that plaster can be applied to the concrete surface.

All-Purpose Blowpipe

A NEW all-purpose welding blowpipe that is designed for a wide range of welding work, including the lightest as well as the heaviest operations, has recently been introduced by The Oxweld Railroad Service Company, Chicago. The new blowpipe, Type W-24R, is light in weight and convenient to handle, and its valve stems are so placed as to be accessible for ready adjustment. Of the tips designed for use on the W-24R blowpipe, the larger sizes are made of drawn copper, of sufficient thickness, it is said, to prevent the heat of heavy welding operations from affecting the efficient operation of the blowpipe. This factor, it is expected, will greatly prolong the service life of these tips.



The All-Purpose Blowpipe

What Our Readers Think

How to Stop Motor-Car Accidents

Fairbury, Neb.

TO THE EDITOR:

I have taken a deep interest in the subject of motor-car accidents and was glad to observe your question in the What's the Answer department, concerning the elimination of motor-car collisions, which is to be answered in the July issue. This question contains much food for thought, and it seems particularly pertinent, for at present we are conducting an intensive safety-first campaign on the Western division of the Rock Island, which has been quite successful, as is evidenced by the fact that this division has received the system safety banner in three of the last five months.

Successful supervision comprises more than the mere accomplishment of a program of work, since it includes, or should include, safe accomplishment, that is, without personal injuries, with the greatest practicable economy. It is generally agreed that, with few exceptions, personal injuries occur as a result of someone's carelessness.

A foreman or supervisor who permits practices which may lead to personal injuries or who fails to teach his men the safe way to do their work, certainly has not been entirely successful in his supervision, no matter how well, how cheaply or how quickly he has completed any job or program or how much work he has accomplished. I am sure that if discipline for violation of safety rules were swift and inevitable, there would be less violations. On the other hand, to discipline the offender only is not enough, for the responsibility seldom rests on him alone; it includes his superior officer who has allowed him to follow the practice which finally led to the injury.

In not a few cases the door has been locked after the horse was stolen. In other words, in too many instances, the action that would have prevented the injury has been taken after the accident has happened. As in many other matters besides safety, the right kind of supervision neither begins nor ends with discipline but requires education.

Any supervisor who is willing to do so can, by instilling into the minds of his foremen the importance of education and training and by seeing to it that they do educate and train their men in safe practices, make personal injuries on his district as scarce as overtime. I say this without fear of successful contradiction. This then, throws the whole matter of responsibility for unsafe practices into the lap of the supervisor.

Supervisors have the necessary authority to appoint motor-car operators, as well as to appoint subordinates to aid in seeing that safe practices are being followed. This means that eventually the supervisor can have men of his own choice in every position upon whom he should be able to rely as having the necessary merit, ability, fitness and will to assume the obligation of the positions they are filling. He will have jobs that have been filled by his predecessors or that must be filled according to the rules of seniority. If they are good men he can educate and train them through proper instruction and supervision. If they are unsafe, stubborn or indifferent or otherwise without the necessary qualifications he can remove them from the service and replace them with men that are qualified.

The supervisor should give periodic examinations to all employees in his department, whose duties may make it desirable for them to operate a motor car, and even to as many others as may desire to take it. This examination should cover all rules relating to the operation of motor cars and should be followed by actual field tests of those who pass the examination on the rules creditably. He should then give preference to those who have the highest standing in the examination and test, regardless of seniority or whether some one else has been acting as operator up to this time.

Supervisors should make surprise tests from time to time to ascertain whether the rules for motor-car operation are being observed. They should apply discipline for the first violation, including in this the foreman who has permitted the violation, and take up the operator's certificate for the second offense.

Supervisors should make it plain to every group of employees that motor cars have no rights, but are subordinate to all trains. This means that the men on the motor car must protect themselves at all times from the hazards of faulty line-ups, inclement weather, limited vision, blind curves, etc., and that while the foreman and operator will be held strictly accountable for motor-car accidents every man in the gang must do his best to guard his own safety and that of the others.

It is important that the operator understands that while he is running the car he has no other business than that of running it and that he must keep his mind wholly on that job. The foreman should likewise insist that the lookouts concentrate on their assignments and that all of the remaining men in the gang are alert and that they refrain from any action that will distract attention.

Whenever the supervisor is with a gang, or if he is only with the foreman or the operator, he should never leave without having a short discussion on safety; he should also insist that the foreman discuss safety with his men daily. Nothing is so impressive as the idea that the boss is intensely interested in the matter. If the supervisor and foreman appear to be indifferent, it is inevitable that the men will be lax in their observance of safety rules.

Supervisors should pay particular attention to the older operators, that is, the men who have been operating motor cars the longest. Nine times out of ten they demonstrate, in some measure at least, that familiarity breeds contempt. Having gone through a long period without "close calls," they show a tendency to relax their vigilance or to take chances.

Whenever any legitimate doubt arises as to the ability or willingness of a motor-car operator to take the safe course in all situations, the supervisor should replace him with a more reliable man. He should not allow a man who has had an accident to resume operation, unless the evidence shows he was not to blame.

It was said in the beginning that supervisors have it in their power to eliminate motor-car accidents. This should be repeated for emphasis. If the word gets out that the first motor-car accident will be the last for any operator who is involved in one, and the men see that the rule is enforced rigidly, this type of accident will practically disappear. Simply enforcing this mandate will be futile, however, unless it is backed up by intensive educational work on the part of the supervisor.

JOHN D. KIRKLAND,
Bridge and Building Department
Chicago, Rock Island & Pacific.

NEWS of the Month

$50,000,000 More for Grade Crossing Elimination

The Senate and the House of Representatives adopted a conference report authorizing the expenditure of $20,000,000 in the fiscal year ending June 30, 1940, and $30,000,000 in the fiscal year ending June 30, 1941, for grade crossing elimination and protection work. The original bills provided for $50,000,000 for each of these fiscal years but it was estimated that there would be a carry-over of $30,000,000 from previous authorizations which will make approximately $80,000,000 available for these two fiscal years.

Increase in Number of Crossing Accidents in 1937

In 1937 there were 1,875 deaths and 5,136 injuries (the largest number since 1930) resulting from rail-highway grade crossing accidents, according to a statement issued by the Interstate Commerce Commission's Bureau of Statistics. The Bureau found that 35 per cent of the accidents occurred at crossings protected by closed gates, watchmen or signals, and approximately 25 per cent of the night accidents occurred where lighting had been specially arranged to illuminate the crossings. In 78 per cent of the accidents, the drivers were reported as having been familiar with the crossing.

Harriman Safety Awards

The eighteenth annual award of E. H. Harriman Memorial medals was made to the New York Central, winner in Group A, to the Ann Arbor in Group B, and to the Nevada Northern in Group C at a meeting in New York on June 6. A certificate of commendation was also awarded the Southern for its good record in Group A. In the classification, Group A includes Class I railroads operating ten million or more locomotive-miles per year, Group B consists of Class I roads operating from one million to ten million locomotive-miles per year and Group C includes Class I roads operating less than one million locomotive-miles per year. The basis of the award is the computation by means of a complex formula of a weighted casualty rate from the figures in the official records and summaries of the Interstate Commerce Commission. In winning the prize for its group, the New York Central operated 120,993,000 locomotive miles in 1937 and its passenger record in 14 consecutive years of 43,474,596,000 passenger-miles without a passenger fatality in a train accident is the best record of this kind to date. The Nevada Northern, which was winner in Group C in 1929 and 1934, as well as in 1937, has a record of 14 consecutive years without an employe fatality and 17 consecutive years without a passenger killed or injured.

Widespread Railway Spending in 1937

The widespread effect of railway buying was shown by the Railway Age, in a recent survey classified by states, of the money spent for purchases, wages and taxes by the Class I railroads of the United States for the year 1937. The total money spent in that year for purchases was $1,153,088,000; for wages, $1,983,990,485; and for taxes $322,391,632, a grand total of $3,459,470,117. Of this sum, the state of Pennsylvania received almost 448 million dollars, Illinois $338,665,006 and New York State $266,272,575. That this spending was widespread was also established by the survey in showing that an average of 31 per cent was spent in off-line states as compared to 69 per cent in the states served by each road.

First Four Months Show Low Net Operating Income

In the first four months of 1938, Class I railroads had a net operating income of $28,791,805, which was equivalent to an annual rate of return on the property investment of these roads of 0.44 per cent, according to the Bureau of Railway Economics of the Association of American Railroads. For the month of April, the total net operating income of the Class I railroads was $9,236,818, equivalent to an annual return of 0.54 per cent, as compared with a net in April, 1937, of $48,357,724, equivalent to an annual return of 2.86 per cent, and a net in April, 1930, of $60,882,332 and a return of 3.61 per cent. Divided between areas, the Western district showed a deficit of $9,035,285 as compared to a net operating income of $22,917,639 in the Eastern district and $14,909,451 in the Southern district.

New Luxury Trains Built by Pullman

On June 15 the New York Central and the Pennsylvania placed in service complete new equipment on their Twentieth Century Limited and Broadway Limited between New York and Chicago on a schedule of 16 hours, the fastest schedule ever operated in regular service between these cities. In addition to exterior streamlined design with flush windows, disappearing roll type steps, etc., the riding qualities are improved with the latest designs of trucks and couplers, and the interior appointments are of striking beauty and convenience. One of the new features of the trains is the roomettes, which are complete, fully-equipped, self-contained private bedrooms, in which the bed folds back into the wall, converting the bedroom into a sitting room for daytime use.

M. & St. L. Dismemberment Disapproved by I. C. C.

The Interstate Commerce Commission handed down a decision on June 14 disapproving the petition of the Associated Railways to acquire the properties of the Minneapolis & St. Louis. In the proposed dismemberment, the Chicago & North Western; the Chicago, Burlington & Quincy; the Chicago, Milwaukee, St. Paul & Pacific; the Chicago, Rock Island & Pacific; the Great Northern; the Illinois Central; and the Minneapolis, St. Paul & Sault Ste. Marie proposed to take over and operate 1,013 miles of the M. & St. L., either jointly or singly, and abandon approximately 303 miles. In the 303 miles which would have been abandoned, 21 towns and villages having a total population in 1930 of 2,854 would have been left without rail service, and it was claimed that approximately 2,000 employees would have been dismissed.

S. P. 30 Mile Relocation

Bids will soon be invited for the relocation through rugged country of 30 miles of the Southern Pacific main line north of Redding, Cal. The relocation, which is estimated to cost about $15,000,000, will involve the building of 12 tunnels and 8 bridges, one of which will be 3,300 ft. long and 470 above the present stream bed. The new location, which removes the present line from the Sacramento River valley, is necessitated by the impending construction north of Redding of Shasta dam by the Bureau of Reclamation. As originally planned, the line would have required two and one-half years to complete before work could be started on the dam, but a modification of the original plan whereby a temporary relocation of approximately 3,000 ft. of the present track at the dam site through a temporary tunnel 1,821 ft. long, which will later serve as a diversion tunnel for the dam construction when the 30-mile relocation is completed, will enable work to start on the dam 30 months sooner.

Association News

Wood-Preservers Association

The Executive committee met at Chicago on June 14, to transact the business of the association and to complete the organization of committees.

Bridge and Building Association

Members of the Executive committee met in Chicago on June 18, with President C. M. Burpee, Vice-Presidents. F. H. Masters, C. A. J. Richards, F. H. Cramer, Executive Committee Members of B. R. Meyers, R. E. Dove and A. Chinn, Secretary-Treasurer C. A. Lichty and Past-Presidents F. E. Weise and Elmer T. Howson in attendance. The committee received preliminary reports from five of the eight standing committees, indicating that these reports are well in hand. The members then discussed at length the program for the next convention and prepared a tentative outline of features of the program in addition to the reports of the committees. Armstrong Chinn, chief engineer of the Alton, was elected vice-president to fill the vacancy created by the resignation of Walter S. Lacher, now secretary of the A.R.E.A.

American Railway Engineering Association

Two association publications will be mailed to the membership during July, these including the June-July Bulletin, No. 404, which will be sent out during the week of July 3, and the Proceedings of the 39th annual convention, held on March 15-17, inclusive, which will be ready for distribution by July 15. The June-July bulletin, which is the first to be issued since the convention in March, will contain addresses presented at the convention by Dr. H. F. Moore, on progress in the joint investigation of fissures in railroad rails, and by Dr. A. N. Talbot, on stresses in track; a report by W. C. Schroeder, A. A. Berk and R. A. O'Brien, on the Bureau of Mines investigation on the intercrystalline cracking of boiler steel, together with an introduction to the report prepared by the Committee on Water Service, Fire Protection and Sanitation; and the annual tie renewal statistics of the railways for 1937, as compiled by the Interstate Commerce Commission.

A feature of Volume 39 of the Proceedings to be issued is a new index, listing the committee reports in numerical order, and giving the page numbers of the discussions in connection with each report. In addition, the typography of the table of contents will appear in revised form to improve its appearance and to facilitate the finding of individual reports listed therein. Changes in the general typography of the covers of the bulletins to be issued during the year will appear first in the June-July bulletin, these changes being designed to improve the appearance of the covers and to simplify the reading of the material thereon.

Six committees held meetings during the past month as follows: Roadway and Ballast, at Chicago, on June 14; Water Service, Fire Protection and Sanitation, at St. Louis, Mo., on June 20; Waterways and Harbors, at Chicago, on June 21; Wood Bridges and Trestles, at Chicago, on June 22; Masonry, at St. Louis, on June 23-24; and Highways, at Chicago, on June 28.

Four committee meetings are scheduled for the month of July, as follows: Track, at Cincinnati, Ohio, on July 6; Iron and Steel Structures, at Buffalo, N.Y., on July 7-8; Economics of Railway Location and Operation, Detroit, Mich., on July 14-15; and Maintenance of Way Work Equipment, at Philadelphia, Pa., on July 12-13.

Railway Tie Association

The Railway Tie Association held a meeting of corporate members at Memphis, Tenn., on May 24-25, at which Meyer Levy, vice-president of the T. J. Moss Tie Company, St. Louis, Mo., was elected president; Walter H. Firman, manager of the Wyoming Tie & Timber Company, Metropolis, Ill., first vice-president; and F. P. Dabolt, president of the Tennessee Tie Company, Memphis, second vice-president. The following were elected members of the Executive committee: H. C. Woolf, president, Bond-Woolf & Co., Alcoa, Tenn.; J. J. Schlafly, president, Potosi Tie & Lumbr Co., St. Louis, Mo.; R. M. Killey, Wood Preserving Corp., Charleston, S. C.; and R. P. Jackson, vice-president, National Lumber & Creosoting Co., Texarkana, Ark.-Tex. The Executive committee re-elected Roy M. Edmonds secretary-treasurer.

At this meeting the members passed a resolution opposing the trucking of crossties and offering to co-operate with the railroads in the development of policies that would discourage this practice.

Roadmasters Association

The officers of the Roadmasters Association met in Chicago on June 13, with President W. O. Frame, Vice-Presidents A. H. Peterson and F. B. Lafleur, Executive Committee Members G. L. Sitton, E. L. Banion, R. L. Sims and T. F. Donahoe, Secretary C. A. Lichty, Committee Chairman A. B. Hillman and Past-President Elmer T. Howson in attendance. After viewing the status of the reports of the various technical committees, the Executive committee gave detailed consideration to the program for the next annual convention for the purpose of making this program of the maximum practical value to the members in these days of restricted maintenance appropriations. The committee adjourned to meet again late in July to complete the program for the convention.

Record Use of Freight Cars in 1937—The average load per car for all cars in carload service in 1937 was 36.7 tons, a new high record.

Personal Mention

General

W. H. Coverdale, chairman of the board of the Seaboard Air Line since 1928, and an engineer by training and experience, was elected president of the railroad corporation at a meeting of the board of directors on June 3. Mr. Coverdale, a member of Coverdale & Colpitts of New York, consulting engineers, was born in Kingston, Ont., in 1871, and received his education in Collegiate Institute, Kingston, and Geneva College, Beaver Falls, Pa.

W. H. Coverdale

He first entered railway service with the Pennsylvania Lines West in 1891 as a member of the engineering department and since 1900 has been engaged as a consulting engineer. In 1913 he became a member of Coverdale & Colpitts.

Engineering

A. H. Bicker, assistant engineer in the office of the chief engineer of maintenance of way and structures of the Southern at Cincinnati, Ohio, has been promoted to chief clerk of that office, succeeding **J. W. Gray,** who retired on April 30.

G. B. Stearns, assistant valuation engineer of the Coast lines of the Atchison, Topeka & Santa Fe, with headquarters at Los Angeles, Cal., was promoted, effective May 1, to valuation engineer of the Coast lines, with the same headquarters, succeeding **J. B. Skeen,** whose death was reported in the May issue.

Clifford H. Higgins, assistant division engineer of the Portland division of the Boston & Maine, with headquarters at Dover, N. H., has been promoted to division engineer of the New Hampshire division, with headquarters at Concord, N. H., succeeding **Russell Burroughs,** whose death is noted elsewhere in these columns.

Mr. Higgins was born on September 17, 1892, at Westbrook, Me., and attended Brown university. He entered railway service with the Maine Central in September, 1912, in an engineering capacity,

and was subsequently promoted successively to the positions of assistant engineer, assistant roadmaster and roadmaster. He was holding the latter position in October, 1929, when he entered the service of the Boston & Maine as assistant division engineer of the Portland division at Dover.

P. O. Ferris, division engineer of the Susquehanna division of the Delaware & Hudson, with headquarters at Oneonta, N.Y., has been appointed acting engineer maintenance of way, with headquarters at Albany, N.Y., succeeding **H. S. Clarke** whose death June 25 is reported elsewhere in these columns. **R. S. Gutelius,** general roadmaster of the Pennsylvania division, with headquarters at Carbondale, Pa., has been appointed acting division engineer at Oneonta, to replace Mr. Ferris.

A. E. Owen, chief engineer of the Central Railroad of New Jersey, with headquarters at Jersey City, N. J., has had his jurisdiction extended to include the Reading, at Philadelphia, Pa., succeeding **Clark Dillenbeck,** retired, effective July 1. **E. Y. Allen,** special engineer of the Reading, has been appointed to the newly created position of assistant chief engineer of the Reading, with headquarters, as before, at Philadelphia. **A. M. Zabriskie,** principal assistant engineer of the Central Railroad of New Jersey, has been appointed to the newly created position of assistant chief engineer of that road, with headquarters, as before, at Jersey City.

Arthur G. Holt, assistant to the chief engineer of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, retired, effective June 1. Mr. Holt was born at Chatfield, Minn., on August 30, 1864, and graduated from the University of Minn-

Arthur G. Holt

esota in 1885. He entered railway service in that year as a rodman on the Milwaukee, but left that road in 1887 to go with the Great Northern as a resident engineer. In 1889 he went to the Duluth & Winnipeg (now part of the Great Northern) as a resident engineer, but in 1890 he returned to the Milwaukee as an instrumentman and assistant engineer at Minneapolis, Minn. In 1905 Mr. Holt was promoted to division engineer in charge of construction work in Washington and Idaho, and in 1913 he was promoted to assistant chief engineer, with headquarters in Chicago, later being appointed assistant to the chief engineer, the position he held at the time of his retirement.

F. T. Beckett, assistant chief engineer of the Chicago, Rock Island & Pacific, with headquarters at Kansas City, Mo., has retired, effective June 1, and the position of assistant chief engineer is

F. T. Beckett

abolished. Mr. Beckett was born at Frankfort, Kan., on October 2, 1870, and entered railway service on March 23, 1897, as a chainman on the Atchison, Topeka & Santa Fe, later serving as a rodman and instrumentman with this road. In April, 1900, he went with the Chicago, Burlington & Quincy as an assistant engineer on double track construction in western Iowa, but left the Burlington in June, 1902, to return to the Santa Fe as an assitant engineer on construction in New Mexico. On January 1, 1903, he was promoted to division engineer at San Marcial, N. M., and from September, 1906, to March, 1908, he served as an assistant engineer on location and construction in Oklahoma and New Mexico. From March 1, 1908, to November 1, 1913, he was with the El Paso & Southwestern (now part of the Southern Pacific) as a resident engineer. At the end of this period Mr. Beckett entered the service of the Rock Island as engineer maintenance of way of the Second district at El Reno, Okla., and in 1932 he was advanced to engineer maintenance of way of the system, with headquarters at Kansas City. On July, 1936, he was appointed assistant chief engineer, with headquarters at Kansas City, the position he held at the time of his retirement.

W. E. Wood, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific at Chicago and former district engineer, retired from service on May 1. Mr. Wood was born at Monroe, Wis., on January 2, 1860, and upon graduation from the University of Wisconsin he began railroad service as a rodman on the Great Northern. A short time later, in 1879, he became a rodman on the Chicago, Milwaukee & St. Paul. In 1882, he was promoted to assistant engineer and in 1886 he was appointed assistant engineer and bridge inspector. In 1888, he was advanced to assistant engineer in charge of masonry construction, and in 1890 he was promoted to first assistant engineer of bridges and buildings. He was advanced to district engineer, with headquarters at Marion, Iowa, in 1899. On April 1, 1921, he was appointed assistant engineer at Chicago, the position he held at the time of his retirement.

Track

O. D. Hoge, extra gang foreman on the Coast lines of the Atchison, Topeka & Santa Fe has been promoted to roadmaster at Parker, Ariz., succeeding **W. R. Pieschke,** who has been transferred to Gadllup, N. M. Mr. Pieschke in turn replaced **H. E. Preece,** who was transferred to Stockton, Cal., relieving **Lee Van Gundy,** resigned.

Maurice R. Black, instrumentman in the engineering department of the Louisville & Nashville, has been promoted to track supervisor, with headquarters at Etowah, Tenn.

L. F. Beard, track supervisor on the Pennsylvania, with headquarters at Anderson, Ind., has been transferred to Columbus, Ohio. **Paul Reeves** has been transferred to Anderson, and **W. P. Maloney** has been assigned to other duties.

W. M. Swanson, who has been off duty on account of ill health, returned to duty effective June 1 as roadmaster on the Chicago, Burlington & Quincy, with headquarters at Centerville, Iowa, replacing **L. L. Smith,** who has been assigned to other duties.

Fred White, whose promotion to roadmaster on the Terre Haute division of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Terre Haute, Ind., was reported in the May issue, was born at Jefferson, Iowa, and first entered railway service in April, 1911, as a section laborer. In 1919 he was promoted to section foreman and since that year he has been a section foreman and an extra-gang foreman until his recent promotion April 1. Mr. White was formerly located at Panora, Iowa.

Frank J. Herlehy, whose promotion to roadmaster on the Chicago, Milwaukee, St. Paul & Pacific with headquarters at Milwaukee, Wis., was reported in the June issue of *Railway Engineering and Maintenance,* was born at Savanna, Ill., on January 7, 1909, and entered railway service on the Milwaukee on June 15, 1926, as a clerk in the mechanical department. He subsequently worked as a brakeman, section laborer, assistant foreman, foreman, and extra gang foreman in the Chicago Terminal and on system extra gangs. Mr. Herlehy was an extra gang foreman at the time of his promotion to roadmaster.

A. H. Exon, assistant track supervisor on the St. Louis division of the Southern, with headquarters at Huntingburg, Ind., has been promoted to track supervisor on the Western lines, with headquarters at Chattanooga, Tenn., succeeding **J. W. Marks,** whose death on February 20 was reported in the April issue, and **L. Woodall, Jr.,** assistant to roadmaster at Somerset, Ky., has been appointed assistant

track supervisor at Huntingburg to replace Mr. Exon. **C. C. Mullen,** assistant bridge and building supervisor on the New Orleans & Northeastern (a part of the Southern system), with headquarters at Hattiesburg, Miss., has been appointed assistant to the Roadmaster at Somerset, relieving Mr. Woodall.

Walter S. Williams, whose promotion to supervisor on the Illinois Central with headquarters at Mattoon, Ill., was reported in the June issue of *Railway Engineering and Maintenance,* was born in Woodlawn, Ill., on March 18, 1905, and began railway service with the Illinois Central in May, 1923, as a laborer. From December, 1924, to March, 1925, he served as a supervisor's clerk, and at the end of that period served again as a laborer until July, 1925, when he was promoted to assistant foreman. In April, 1926, he was promoted to foreman and in September, 1929, he was advanced to general foreman. Mr. Williams served subsequently as section foreman and extra gang foreman on the Illinois division until his recent promotion to supervisor.

E. E. Crowley, roadmaster on the Susquehanna division of the Delaware & Hudson, with headquarters at Oneonta, N.Y., has been transferred to the Saratoga division, with headquarters at Albany, N.Y., and the position of roadmaster on the Susquehanna division has been abolished. **O. W. Stephens,** bridge and building supervisor on the Saratoga division, with headquarters at Watervliet, N.Y., has been appointed track supervisor on the Susquehanna division at Oneonta, and the position of bridge and building supervisor on the Saratoga division, has been abolished. **J. J. Hayes,** general roadmaster of the Saratoga division, with headquarters at Saratoga Springs, N.Y., and **George Smith,** general roadmaster of the Champlain division, with headquarters at Plattsburg, N.Y., have retired and the positions of general roadmaster on both these divisions have been abolished.

Bridge and Building

J. B. Clancy, supervisor of bridges of the Delaware & Hudson, with headquarters at Green Island, N.Y., has retired and his former position has been abolished.

Charles W. Ettinger, paint foreman and formerly supervisor of bridges and buildings on the Chicago Terminal division of the Illinois Central, with headquarters at Chicago, retired from service on May 1.

W. Walkden, bridge engineer of the Canadian National at Winnipeg, has had his jurisdiction extended to include also the building department. **R. E. Taylor,** chief draftsman and structural designer in the office of the building engineer at Winnipeg, Man., has been promoted to building engineer at that point, succeeding **G. C. Briggs,** whose death on March 16 was reported in the April issue. Mr. Taylor will report to Mr. Walkden.

Mr. Taylor was born in South Shields, England, on April 14, 1890, and attended Sunderland Technical College, England. He entered railway service in 1906 with the Northeastern Railway Co. (now the London & Northeastern) in England, serving his apprenticeship from 1906 to 1911. In 1911, he came to this country and entered the service of the Grand Trunk Pacific (now a part of the Canadian National) as a rodman on location and construction, later serving as an instrumentman and a draftsman. In 1913 he went with the Hudson Bay Railway as architectural draftsman, and from 1914 to 1917 served as an instrumentman on construction. During the war Mr. Taylor was a member of the Canadian Expeditionary Force and upon his return became architectural draftsman for the Canadian National at Winnipeg. In 1928 he was promoted to chief draftsman and structural designer at Winnipeg, the position he held until his promotion.

William J. Mahoney, assistant supervisor of bridges and buildings on the Louisville & Nashville, with headquarters at Louisville, Ky., has been promoted, effective June 16, to supervisor of bridges and buildings with the same headquarters, succeeding **James E. Rawlinson,** who retired on May 31. **J. McClure Salmon, Jr.,** draftsman in the office of the chief engineer at Louisville, has been promoted to assistant supervisor of bridges and buildings, with headquarters at Louisville, replacing Mr. Mahoney. **John U. Estes,** draftsman in the office of the chief engineer, has been promoted, effective May 9 to assistant supervisor of bridges and buildings, with headquarters at Birmingham, Ala., succeeding **J. W. McKinney,** who retired on April 30.

Mr. Mahoney started his railroad service in 1901 for the Atlanta, Knoxville & Northern (now a part of the L. & N.) and was promoted to foreman in 1905. In 1917 after the A. K. & N. was taken over by the L. & N. he was appointed acting supervisor of bridges and buildings and a year later he was appointed supervisor of bridges and buildings. On July 31, 1930, Mr. Mahoney was transferred to the Nashville division, and in January, 1934, when the Louisville and Birmingham divisions were consolidated he was appointed assistant supervisor of bridges and buildings, with headquarters at Louisville, the position he has held until his recent promotion.

A. C. Jones, assistant bridge and building supervisor on the St. Louis division of the Southern, with headquarters at Princeton, Ind., has been promoted to bridge and building supervisor on the Mobile division, with headquarters at Wilton, Ala., succeeding **R. J. Jones,** who has retired. **S. T. Montgomery,** student apprentice, has been promoted to assistant bridge and building supervisor at Princeton to replace Mr. A. C. Jones. **C. I. Parsons,** student apprentice, has been promoted to assistant bridge and building supervisor on the New Orleans & Northeastern (part of the Southern system), with headquarters at Hattiesburg, Miss., relieving **C. C. Mullen,** whose promotion to assistant to roadmaster is reported elsewhere in this issue. **T. M. von Sprecken,** assistant bridge and building supervisor on the Alabama Great Southern (part of the Southern system), with headquarters at Birmingham, Ala., has been promoted to bridge and building supervisor at Somerset, Ky., succeeding **L. B. Craig,** who has been promoted. **J. R. Mumford,** assistant supervisor at Birmingham, has been promoted to assistant supervisor of bridges and buildings at that point, replacing Mr. von Sprecken.

Mr. von Sprecken was born at Augusta, Ga., on August 7, 1893, and graduated from the University of Georgia in 1914. He entered railroad service on the Southern in 1914, and was promoted to assistant engineer in 1917. He was advanced to resident structural engineer in 1928, and in 1937 he was appointed assistant supervisor of bridges and buildings on the Alabama Great Southern, with headquarters at Birmingham, Ala., the position he held at the time of his recent promotion.

Mr. A. C. Jones was born at Tupelo, Miss., on November 6, 1900, and entered railway service on February 15, 1918, as a carpenter helper on the Southern. He was promoted to bridge and building mechanic in January, 1919, and also acted as a relief foreman from that date until October 13, 1923, when he went with the Mobile & Ohio as assistant pile driver foreman. On October 13, 1926, Mr. Jones returned to the Southern system as bridge and building foreman on the Cincinnati, New Orleans & Texas Pacific, with headquarters at Lexington, Ky., and on August 15, 1937, he was advanced to assistant supervisor of bridges and buildings on the Louisville division, with headquarters at Princeton, Ind., the position he held at the time of his promotion.

Special

August Meyer, chief treatment supervisor in charge of all treatment and inspection of ties and lumber on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, retired effective June 1. Mr. Meyer was born at Copenhagen, Denmark, on February 18, 1872, and entered railway service in the mechanical department of the Chicago, Burlington & Quincy in 1900, but was later transferred to the engineering department and then to the purchasing department, and stationed in the timber treating plant at Sheridan, Wyo. In August, 1906, he was transferred to Galesburg, Ill., to assist in the building of a treating plant at that point and upon its completion was appointed supervisor of the new treating plant. In 1920, he left the Burlington to go with the Walsh Tie Company as a supervisor at Minneapolis, Minn., and in 1922 he resigned to return to Denmark. Upon his return to the United States he experimented for some time with the treatment of telegraph pole butts, and was awarded two patents in

Pressure-Treated Ties Save Millions for Railroads

Railroads have proved that ties which have been pressure-treated with creosote have a service life from five to seven times greater than untreated ties. Because of this experience, railroads have pioneered in the use of pressure-treated timber for many other purposes.

The Wood Preserving Corporation, one of the chief suppliers of pressure-treated cross ties, has plants at strategic locations throughout the country which are fully equipped to supply treated timber according to specifications.

Please send us special information on the use of pressure-treated timber for (fill in use).....

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Your Name.....

Railroad.....

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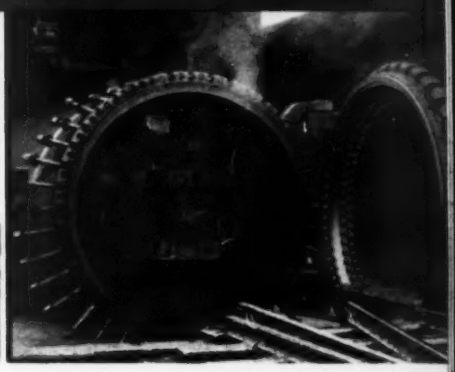
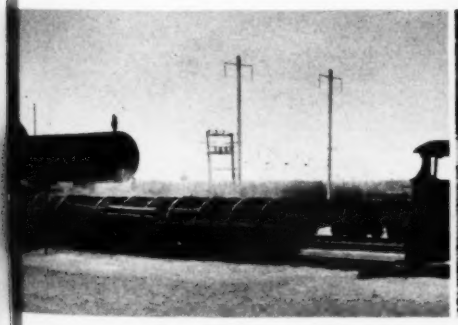
Ties stacked for air seasoning before pressure treatment with creosote. The Wood Preserving Corporation has ample stocks at its various plant locations to assure prompt shipments.

One of The Wood Preserving Corporation's many plants where timber is pressure-treated with creosote or other preservatives to give it long service life.



Timber thoroughly pressure treated with creosote gives many years of trouble-free service. The Wood Preserving Corporation also has complete facilities for the fabrication of lumber and timber before treatment.



Creosoted cross ties leaving pressure treating cylinder. Through the use of pressure-treated timber, replacements are fewer and maintenance costs are reduced to an absolute minimum.

Four track high speed main line of the Pittsburgh and Lake Erie Railroad at Stoops Ferry Station, Pennsylvania. During the period from 1927 to 1936 inclusive, an annual average of only 49.4 cross ties per mile of maintained track were needed to keep the right of way in perfect condition.

IN HOW MANY PLACES (besides Tracks) DO YOU USE TREATED TIMBER?

OTHER PRODUCTS AND USES FOR PRESSURE-TREATED TIMBER

1. Platforms . . . 2. Water Tanks . . . 3. Bridges . . . 4. Culverts . . . . 5. Cribbing . . . 6. Poles . . . 7. Posts . . . 8. Piers . . . 9. Wharves . . . 10. Dock Timbers . . . 11. Ties . . . 12. Piling . . . 13. Crossing Planks . . . 14. Car Stock . . . 15. Structural Timber . . . 16. Fences . . . 17. Cooling Towers . . . 18. Third rail ties and guards . . . 19. Flume . . . 20. Trench Lining and Covers

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How Permanent Is Concrete?

Ten year study focuses attention on the solubility in water of some of the main compounds formed by the original hydration of the cement

By David L. Snader

Former Research Fellow, Columbia University
Professor of Civil Engineering, Stevens Institute of Technology

THE portland cement industry in the United States stands as one of the great industries of the world, and it developed with unprecedented rapidity during the early years of the twentieth century. Paralleling this extraordinary growth was the use of concrete for engineering structures, not only for those works which had hitherto been built of cut stone masonry or brick, substitute for earlier timber and for ma[sonry] structions.

It was more or less generally stated as a basis for this latter movement that portla[nd] ment was a permanent material and that structur[es] of it, [if] would require little or no [attention] such a rapid gro[wth]

The report by Professor David L. Snader on the 10-year concrete study at the Civil Engineering Testing Laboratories at Columbia University, created a great deal of interest when abstracted in a Railway magazine. In a later issue, a number of prominent railway engineers published their comments on it.

THE REAL ANSWER IS IN THIS PARAGRAPH

IN MR. SNADER'S REPORT.

fully satisfactory degree of impermeability. The importance, in all concrete structures, of securing any increase in water-tightness which may be possible, cannot, however, be disputed.

(b) Where contact with moisture is more or less constant, it may be prevented from reaching the vital binding cement matrix, through the use of suitable external waterproofing.

11. Beyond the province of the engineer, what may be done to prevent disintegration of concrete? In short, is it possible for the manufacturer to improve or modify cement as a manufactured product, so that if moisture [penetrates] the hardened cement [matrix] of the concrete

Concrete, one of the important structural materials used today, should be waterproofed to prevent deterioration. Only then can its advantages be obtained and utilized in full. The cost of waterproofing is negligible compared to the cost of the structure.

To secure impermeability, specify the application of Koppers Tar Membrane Waterproofing on bridge decks, tunnels, culverts, retaining walls, and sub-structures.

The deterioration of exposed concrete structures usually can be arrested by building up a water repellent shell within the concrete surface by successive brush or spray applications of Koppers High Penetration Primer. Surface voids are sealed with Koppers Seal Coat or given an aluminum finish with Koppers Lumino.

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that field. In October, 1926, Mr. Meyer went with the Milwaukee as chief treatment supervisor, with headquarters in Chicago, and held that position until his retirement.

Obituary

Herbert S. Clarke, engineer maintenance of way of the Delaware & Hudson, with headquarters at Albany, N.Y., died on June 25 at Boston, Mass., following an operation.

Frank R. Coates, chief engineer of the Chicago Great Western from 1899 to 1904, and more recently associated with the Henry L. Doherty interests in public utility management, died at Avon, N.J., on June 27, after two weeks' illness.

Harry C. Goodrich, chief engineer of the Bingham & Garfield and of the Utah Copper Company, whose death was reported in the June issue of *Railway Engineering and Maintenance* was born in Chicago on January 27, 1868, and received his higher education at Elgin Academy, Elgin, Ill., and at Penn College at Oskaloosa, Iowa. He entered railway service in 1887 as a levelman on the Chicago & Northwestern, and later served as a transitman and construction engineer. In 1895, he left the North Western to go into construction engineering work with the Alfred Noble Enterprises, and in 1898 he entered the engineering service of the United States government as a chief of party. In 1900, he re-entered railway service as a location and construction engineer on the Denver & Rio Grande Western, serving in that capacity until 1906, when he was made chief engineer of the Utah Copper Company and of the Bingham & Garfield Railway, which titles he continued to hold until his death.

Harry C. Goodrich

Russell Burroughs, division engineer of the New Hampshire division of the Boston & Maine, with headquarters at Concord, N. H., died on May 23 of heart disease. Mr. Burroughs was born at Dunbarton, N. H., on June 4, 1874, and entered the service of the Boston & Maine on February 1, 1899, as a transitman. Subsequently he was advanced through the positions of assistant engineer and acting division engineer, being appointed division engineer of the old Worcester, Nashua & Portland division, with headquarters at Nashua, N. H., on July 1, 1915. Ten years later, he was transferred to the New Hampshire division with headquarters at Concord, where he was located at the time of his death.

Supply Trade News

General

The Lehigh Portland Cement Company, Allentown, Pa., has acquired the **Mikolite Company,** Kansas City, Kan., and is operating it as a subsidiary.

Personal

C. D. Hicks, president of C. D. Hicks & Company, St. Louis, Mo., has been appointed sales representative of the **Aladdin Lubricator Company,** Inc., Berkeley, Cal., for the southerly and southwest territory. **The Lundie Engineering Corporation,** New York, has been appointed sales representative for all territory east of Chicago.

G. R. Lyman, vice-president of the Pettibone-Mulliken Corp., Chicago, has been placed in charge of operation, following the resignation of **J. B. Campbell** as vice-president and a director.

F. J. Demarest was elected president and **H. G. Russell,** treasurer and general manager of **Greene, Tweed & Co.,** New York, at a recent meeting of its board of directors. **J. A. McKeon** remains as vice-president and **H. A. Erwood** as secretary.

Thorn Pendleton has been elected president of the Warren Tool Corporation, Warren, Ohio, succeeding **C. L. Schoonover,** whose death on May 22 was reported in the June issue. Mr. Pendleton was born on June 24, 1907, at Youngstown, Ohio, and graduated from Williams College, Williamstown, Mass., in 1931, after which he attended the graduate school of the University of Pennsylvania in 1932. In the following year he was elected secretary and a director of the Warren Tool Corporation and secretary and director of the Trumbull Manufacturing Company, in the same city.

Thorn Pendleton

Obituary

Arthur P. Van Schaick, vice-president in charge of sales of the American Chain and Cable Company, Inc., died on June 7 on the Panama Limited while en route to his home at Southport, Conn. Mr. Van Schaick was born in Chicago on December 29, 1882, and attended Williams College. He joined the American Chain and Cable Company, Inc., in 1919 as manager of sales and was elected a director several years later. In 1935 he was elected vice-president in charge of sales, the title he held at the time of his death. He was president of the National Railway Appliances Association in 1913.

Trade Publications

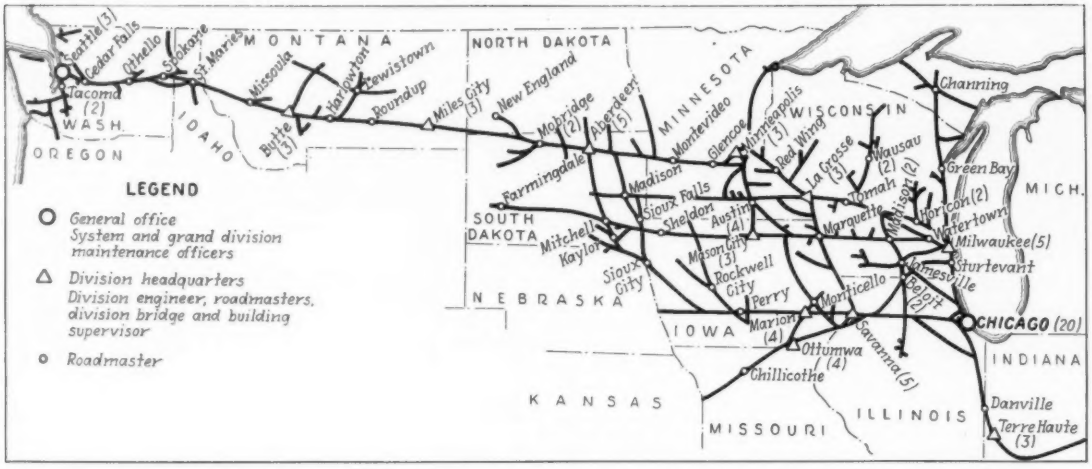
General Purpose Hoists—The American Hoist & Derrick Company, St. Paul, Minn., has issued Bulletin HB-3 describing and illustrating its new line of general purpose hoists, which are provided with gasoline engine and electric power drive. The bulletin includes specifications and load and speed ratings for the new hoists, and points out the features which adapt them to a wide range of work.

Spike Grid Connectors—The Timber Engineering Company, Washington, D. C., has issued a four-page folder illustrating and describing a new device for the transfer of stress between members in a wood structure. It comprises an open grid washer with protruding spikes that become imbedded in the adjoining faces of timbers when the bolt is drawn up. Data are given on sizes, working loads and methods of installing.

Engines and Power Units—This is the title of a 24-page illustrated booklet recently issued by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., which is devoted to a presentation of the various types of power units manufactured by this company. Each engine is described in detail and performance curves are given. Design features common to all Allis-Chalmers engines are described and complete specifications concerning each engine are included.

Pipe Materials—The A. M. Byers Company, Pittsburgh, Pa., has published a 40-page technical bulletin entitled "Wrought Iron for Piping Systems." This booklet discusses pipe materials commonly used: wrought iron, steel, cast iron, brass and copper, their relative costs and factors in pipe selection, and continues with a discussion of why some metals resist corrosion better than others. After treating of the corrosive conditions encountered in water supply systems, drainage systems, and heating and power systems, the bulletin concludes with an appendix giving suggestions for reducing corrosive effects, and containing statistical data regarding the life of various pipe materials, gathered from soil and vent records of pipe installations in New York and Chicago. Included in the publication are many illustrations of piping systems.

TO RAILWAY SUPPLY MANUFACTURERS



Railway Engineering and Maintenance Goes Every Month to 110 Supervisory Maintenance Officers on the Chicago, Milwaukee, St. Paul & Pacific Railway at 2 General Offices, 14 District and Division Headquarters and 51 Roadmasters Headquarters, Scattered All the Way from Terre Haute, Ind., to Seattle, Wash.

IN SELLING THE RAILWAYS

SOME companies concentrate on the purchasing agent.

OTHER companies call on the system engineering officers.

STILL OTHER companies include among their prospects the district and possibly the division engineering officers.

BUT those companies that do the most successful job include *all* these men and *also* the roadmasters and (or) supervisors of bridges, buildings and water service—knowing that an order may originate with any of these men.

To tell one's story to each of these men personally is the ideal. But to do this requires a great deal of time and money—for these men are widely scattered—and they are seldom in their offices.

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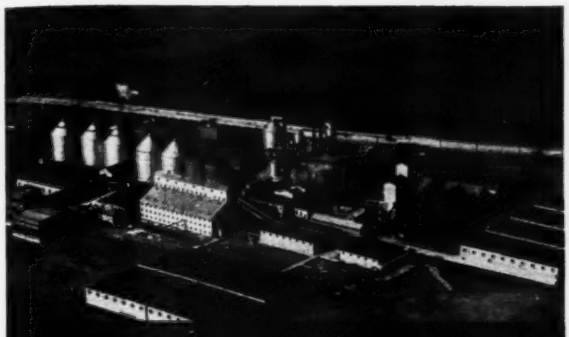
RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS



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DISTRICT OFFICES

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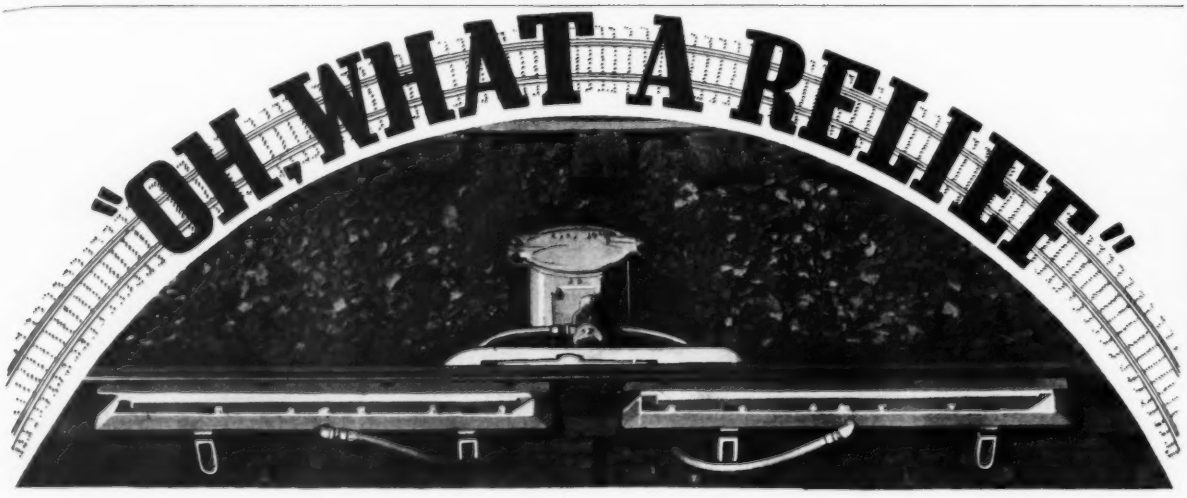
Agents in Other Principal Cities

"OH, WHAT A RELIEF"



That's what a locomotive would say, if it could talk, when it hit a curve on which a Meco Curve Lubricator had just been installed.

It takes the teeth right out of curve friction, reduces the train resistance to that of straight track.

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- Reduces cost of maintaining gauge and line on curves.
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- Decreases train resistance—cuts fuel costs.
- Prevents wheel screeching on curves.
- Increases safety of train operation and permits higher speeds.
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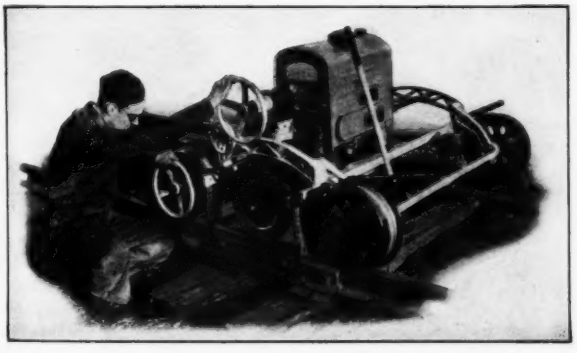

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